Configuring and Managing a Red Hat Cluster

Red Hat Cluster Suite for Red Hat Enterprise Linux 4.5

4.5

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Configuring and Managing a Red Hat Cluster describes the configuration and management of Red Hat cluster systems for Red Hat Enterprise Linux 4.5. It does not include information about Red Hat Linux Virtual Servers (LVS). Information about installing and configuring LVS is in a separate document.

Configuring and Managing a Red Hat Cluster: Red Hat Cluster Suite for Red Hat Enterprise Linux 4.5

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Introduction

This document provides information about installing, configuring and managing Red Hat Cluster components. Red Hat Cluster components are part of Red Hat Cluster Suite and allow you to connect a group of computers (called *nodes* or *members*) to work together as a cluster. This document does not include information about installing, configuring, and managing Linux Virtual Server (LVS) software. Information about that is in a separate document.

The audience of this document should have advanced working knowledge of Red Hat Enterprise Linux and understand the concepts of clusters, storage, and server computing.

This document is organized as follows:

- *Chapter 1, Red Hat Cluster Configuration and Management Overview*
- *Chapter 2, Before Configuring a Red Hat Cluster*
- *Chapter 3, Configuring Red Hat Cluster With **Conga***
- *Chapter 4, Managing Red Hat Cluster With **Conga***
- *Chapter 5, Configuring Red Hat Cluster With `system-config-cluster`*
- *Chapter 6, Managing Red Hat Cluster With `system-config-cluster`*
- *Appendix A, Example of Setting Up Apache HTTP Server*
- *Appendix B, Fence Device Parameters*

For more information about Red Hat Enterprise Linux 4.5, refer to the following resources:

- *Red Hat Enterprise Linux Installation Guide* — Provides information regarding installation.
- *Red Hat Enterprise Linux Introduction to System Administration* — Provides introductory information for new Red Hat Enterprise Linux system administrators.
- *Red Hat Enterprise Linux System Administration Guide* — Provides more detailed information about configuring Red Hat Enterprise Linux to suit your particular needs as a user.
- *Red Hat Enterprise Linux Reference Guide* — Provides detailed information suited for more experienced users to reference when needed, as opposed to step-by-step instructions.
- *Red Hat Enterprise Linux Security Guide* — Details the planning and the tools involved in creating a secured computing environment for the data center, workplace, and home.

For more information about Red Hat Cluster Suite for Red Hat Enterprise Linux 4.5, refer to the following resources:

- *Red Hat Cluster Suite Overview* — Provides a high level overview of the Red Hat Cluster

Suite.

- *LVM Administrator's Guide: Configuration and Administration* — Provides a description of the Logical Volume Manager (LVM), including information on running LVM in a clustered environment.
- *Global File System: Configuration and Administration* — Provides information about installing, configuring, and maintaining Red Hat GFS (Red Hat Global File System).
- *Using GNBD with Global File System* — Provides an overview on using Global Network Block Device (GNBD) with Red Hat GFS.
- *Linux Virtual Server Administration* — Provides information on configuring high-performance systems and services with the Linux Virtual Server (LVS).
- *Red Hat Cluster Suite Release Notes* — Provides information about the current release of Red Hat Cluster Suite.

Red Hat Cluster Suite documentation and other Red Hat documents are available in HTML, PDF, and RPM versions on the Red Hat Enterprise Linux Documentation CD and online at *http://www.redhat.com/docs/*.

1. Document Conventions

Certain words in this manual are represented in different fonts, styles, and weights. This highlighting indicates that the word is part of a specific category. The categories include the following:

`Courier font`

Courier font represents `commands`, `file names and paths`, and `prompts` .

When shown as below, it indicates computer output:

```
Desktop       about.html       logs      paulwesterberg.png
Mail          backupfiles      mail      reports
```

`bold Courier font`

Bold Courier font represents text that you are to type, such as: **`service jonas start`**

If you have to run a command as root, the root prompt (#) precedes the command:

```
# gconftool-2
```

italic Courier font
: Italic Courier font represents a variable, such as an installation directory: *install_dir*/bin/

bold font
: Bold font represents **application programs** and **text found on a graphical interface**.

: When shown like this: **OK** , it indicates a button on a graphical application interface.

Additionally, the manual uses different strategies to draw your attention to pieces of information. In order of how critical the information is to you, these items are marked as follows:

Note

A note is typically information that you need to understand the behavior of the system.

Tip

A tip is typically an alternative way of performing a task.

Important

Important information is necessary, but possibly unexpected, such as a configuration change that will not persist after a reboot.

Caution

A caution indicates an act that would violate your support agreement, such as recompiling the kernel.

Warning

A warning indicates potential data loss, as may happen when tuning hardware for maximum performance.

2. Feedback

If you spot a typo, or if you have thought of a way to make this manual better, we would love to hear from you. Please submit a report in Bugzilla (*http://bugzilla.redhat.com/bugzilla/*) against the component `rh-cs`.

Be sure to mention the manual's identifier:

```
rh-cs(EN)-4.5 (2008-06-01T13:41)
```

By mentioning this manual's identifier, we know exactly which version of the guide you have.

If you have a suggestion for improving the documentation, try to be as specific as possible. If you have found an error, please include the section number and some of the surrounding text so we can find it easily.

Red Hat Cluster Configuration and Management Overview

Red Hat Cluster allows you to connect a group of computers (called *nodes* or *members*) to work together as a cluster. You can use Red Hat Cluster to suit your clustering needs (for example, setting up a cluster for sharing files on a GFS file system or setting up service failover).

1. Configuration Basics

To set up a cluster, you must connect the nodes to certain cluster hardware and configure the nodes into the cluster environment. This chapter provides an overview of cluster configuration and management, and tools available for configuring and managing a Red Hat Cluster.

Configuring and managing a Red Hat Cluster consists of the following basic steps:

1. Setting up hardware. Refer to *Section 1.1, "Setting Up Hardware"*.
2. Installing Red Hat Cluster software. Refer to *Section 1.2, "Installing Red Hat Cluster software"*.
3. Configuring Red Hat Cluster Software. Refer to *Section 1.3, "Configuring Red Hat Cluster Software"*.

1.1. Setting Up Hardware

Setting up hardware consists of connecting cluster nodes to other hardware required to run a Red Hat Cluster. The amount and type of hardware varies according to the purpose and availability requirements of the cluster. Typically, an enterprise-level cluster requires the following type of hardware (refer to *Figure 1.1, "Red Hat Cluster Hardware Overview"*).

- Cluster nodes — Computers that are capable of running Red Hat Enterprise Linux 4 software, with at least 1GB of RAM.
- Ethernet switch or hub for public network — This is required for client access to the cluster.
- Ethernet switch or hub for private network — This is required for communication among the cluster nodes and other cluster hardware such as network power switches and Fibre Channel switches.
- Network power switch — A network power switch is recommended to perform fencing in an enterprise-level cluster.
- Fibre Channel switch — A Fibre Channel switch provides access to Fibre Channel storage. Other options are available for storage according to the type of storage interface; for example, iSCSI or GNBD. A Fibre Channel switch can be configured to perform fencing.

- Storage — Some type of storage is required for a cluster. The type required depends on the purpose of the cluster.

For considerations about hardware and other cluster configuration concerns, refer to *Chapter 2, Before Configuring a Red Hat Cluster* or check with an authorized Red Hat representative.

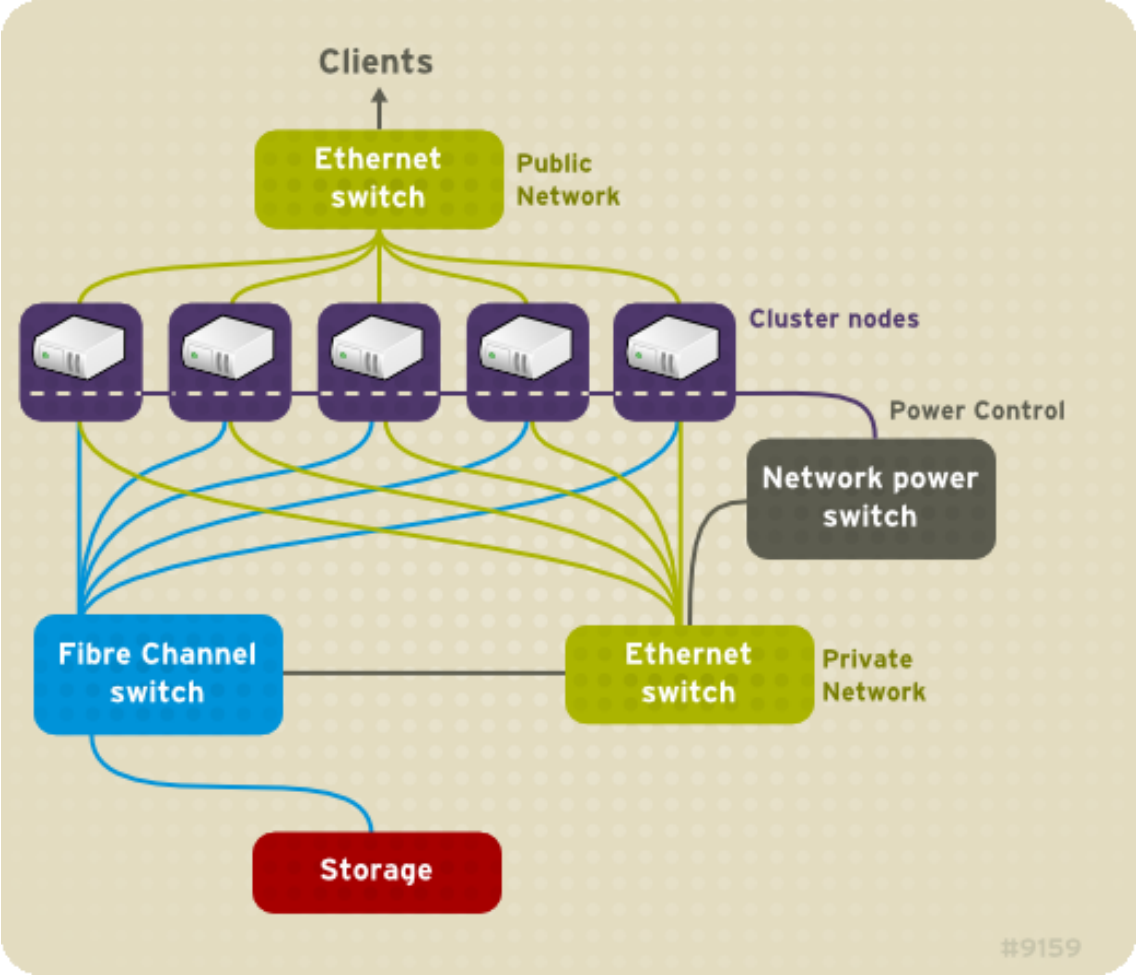

Figure 1.1. Red Hat Cluster Hardware Overview

1.2. Installing Red Hat Cluster software

To install Red Hat Cluster software, you must have entitlements for the software. If you are using the **Conga** configuration GUI, you can let it install the cluster software. If you are using other tools to configure the cluster, secure and install the software as you would with Red Hat Enterprise Linux software.

1.3. Configuring Red Hat Cluster Software

Configuring Red Hat Cluster software consists of using configuration tools to specify the relationship among the cluster components. *Figure 1.2, "Cluster Configuration Structure"* shows an example of the hierarchical relationship among cluster nodes, high-availability services, and resources. The cluster nodes are connected to one or more fencing devices. Nodes can be grouped into a failover domain for a cluster service. The services comprise resources such as NFS exports, IP addresses, and shared GFS partitions.

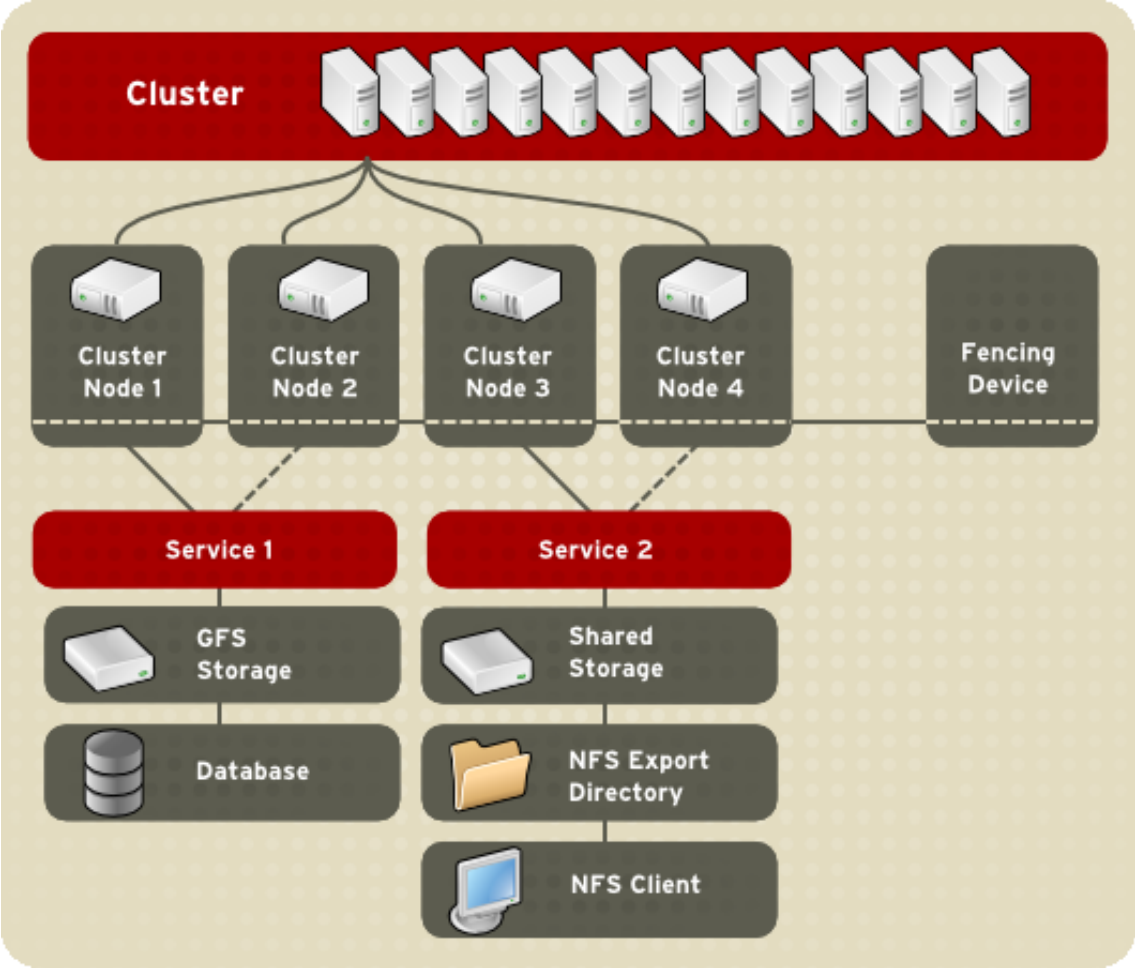

Figure 1.2. Cluster Configuration Structure

The following cluster configuration tools are available with Red Hat Cluster:

- **Conga** — This is a comprehensive user interface for installing, configuring, and managing Red Hat clusters, computers, and storage attached to clusters and computers.
- `system-config-cluster` — This is a user interface for configuring and managing a Red Hat cluster.

- Command line tools — This is a set of command line tools for configuring and managing a Red Hat cluster.

A brief overview of each configuration tool is provided in the following sections:

- *Section 2, "Conga"*
- *Section 3, "`system-config-cluster` Cluster Administration GUI"*
- *Section 4, "Command Line Administration Tools"*

In addition, information about using **Conga** and `system-config-cluster` is provided in subsequent chapters of this document. Information about the command line tools is available in the man pages for the tools.

2. Conga

Conga is an integrated set of software components that provides centralized configuration and management of Red Hat clusters and storage. **Conga** provides the following major features:

- One Web interface for managing cluster and storage
- Automated Deployment of Cluster Data and Supporting Packages
- Easy Integration with Existing Clusters
- No Need to Re-Authenticate
- Integration of Cluster Status and Logs
- Fine-Grained Control over User Permissions

The primary components in **Conga** are **luci** and **ricci**, which are separately installable. **luci** is a server that runs on one computer and communicates with multiple clusters and computers via **ricci**. **ricci** is an agent that runs on each computer (either a cluster member or a standalone computer) managed by **Conga**.

luci is accessible through a Web browser and provides three major functions that are accessible through the following tabs:

- **homebase** — Provides tools for adding and deleting computers, adding and deleting users, and configuring user privileges. Only a system administrator is allowed to access this tab.
- **cluster** — Provides tools for creating and configuring clusters. Each instance of **luci** lists clusters that have been set up with that **luci**. A system administrator can administer all clusters listed on this tab. Other users can administer only clusters that the user has

permission to manage (granted by an administrator).

- **storage** — Provides tools for remote administration of storage. With the tools on this tab, you can manage storage on computers whether they belong to a cluster or not.

To administer a cluster or storage, an administrator adds (or *registers*) a cluster or a computer to a **luci** server. When a cluster or a computer is registered with **luci**, the FQDN hostname or IP address of each computer is stored in a **luci** database.

You can populate the database of one **luci** instance from another **luci**instance. That capability provides a means of replicating a **luci** server instance and provides an efficient upgrade and testing path. When you install an instance of **luci**, its database is empty. However, you can import part or all of a **luci** database from an existing **luci** server when deploying a new **luci** server.

Each **luci** instance has one user at initial installation — admin. Only the admin user may add systems to a **luci** server. Also, the admin user can create additional user accounts and determine which users are allowed to access clusters and computers registered in the **luci** database. It is possible to import users as a batch operation in a new **luci** server, just as it is possible to import clusters and computers.

When a computer is added to a **luci** server to be administered, authentication is done once. No authentication is necessary from then on (unless the certificate used is revoked by a CA). After that, you can remotely configure and manage clusters and storage through the **luci** user interface. **luci** and **ricci** communicate with each other via XML.

The following figures show sample displays of the three major **luci** tabs: **homebase**, **cluster**, and **storage**.

For more information about **Conga**, refer to *Chapter 3, Configuring Red Hat Cluster With **Conga***, *Chapter 4, Managing Red Hat Cluster With **Conga***, and the online help available with the **luci** server.

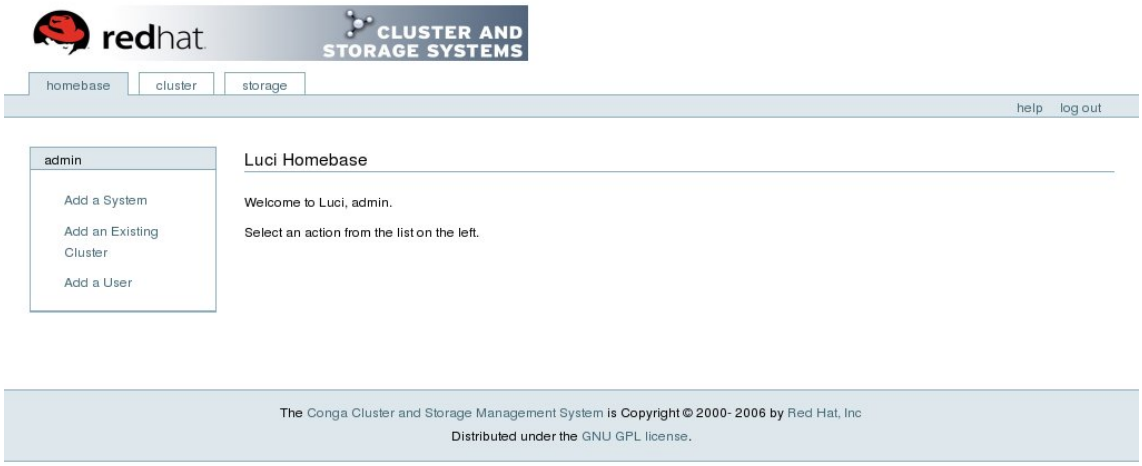

Figure 1.3. luci homebase Tab

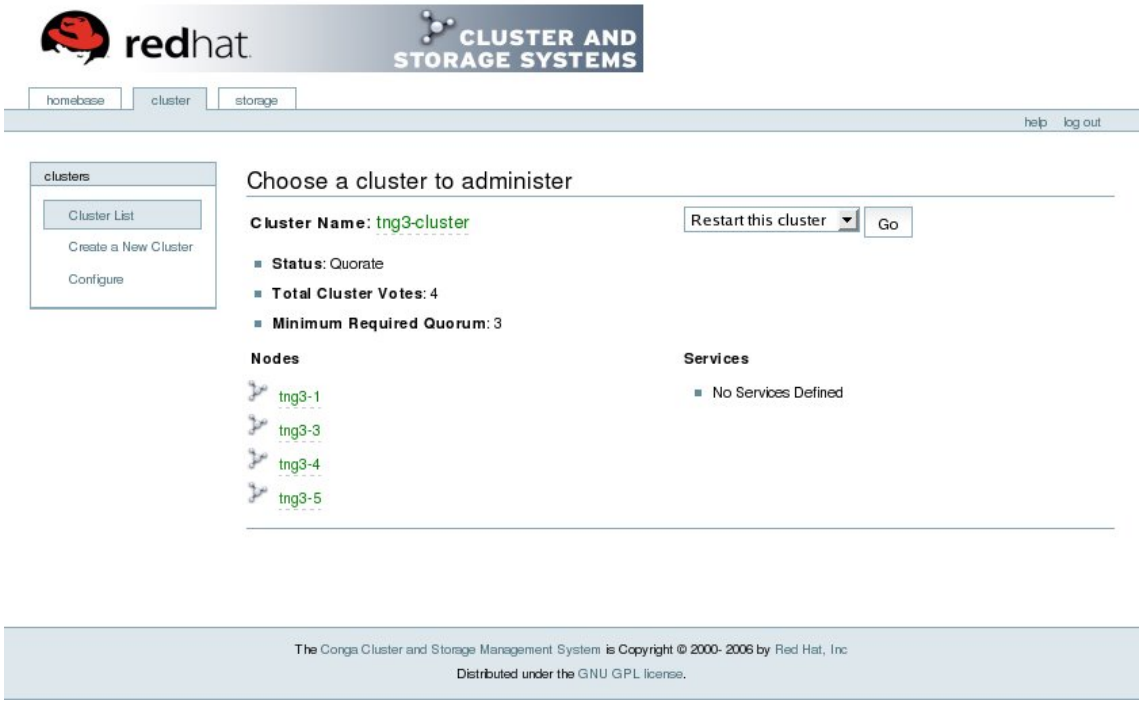

Figure 1.4. luci cluster Tab

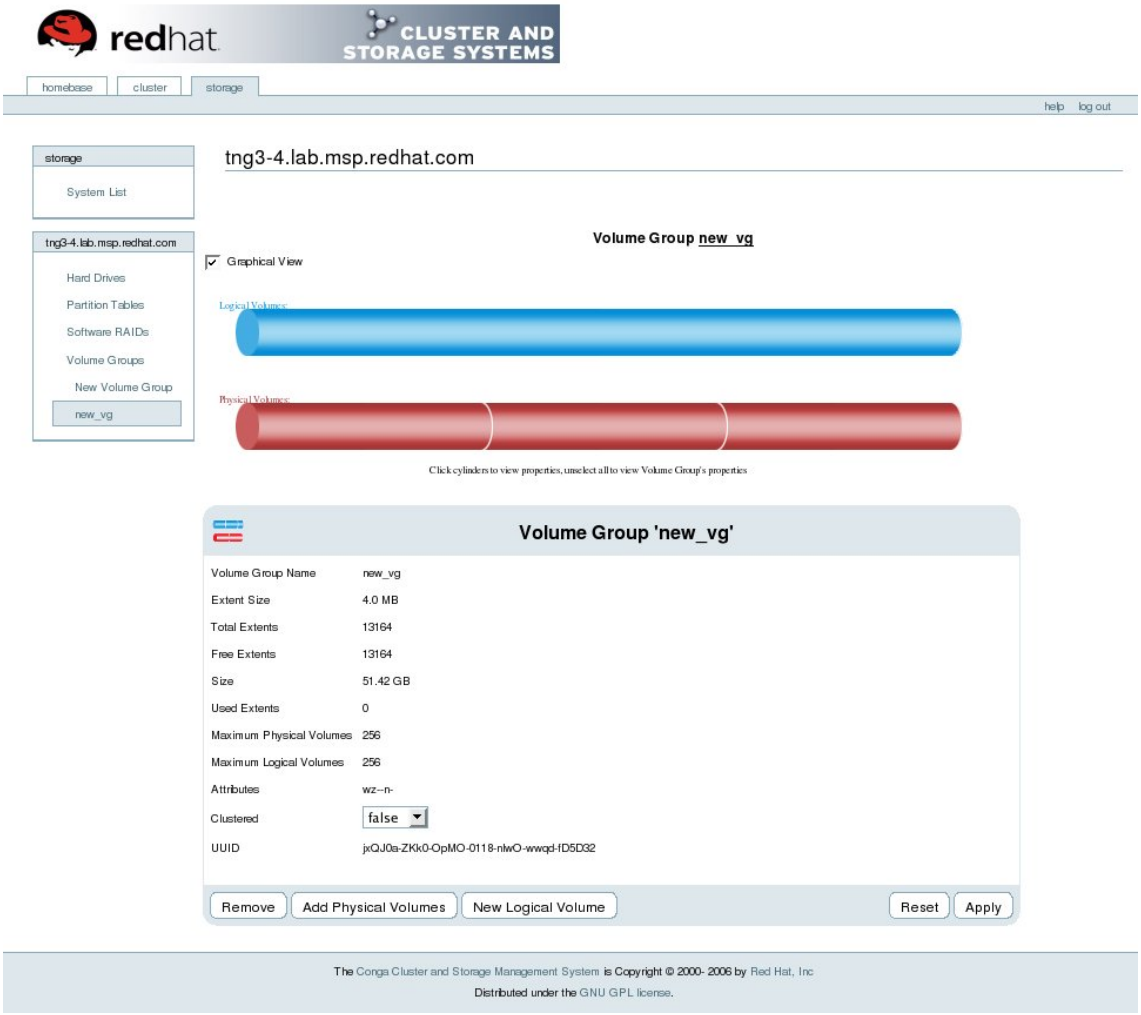

Figure 1.5. luci storage Tab

3. `system-config-cluster` Cluster Administration GUI

This section provides an overview of the cluster administration graphical user interface (GUI) available with Red Hat Cluster Suite — `system-config-cluster`. It is for use with the cluster infrastructure and the high-availability service management components. `system-config-cluster` consists of two major functions: the **Cluster Configuration Tool** and the **Cluster Status Tool**. The **Cluster Configuration Tool** provides the capability to create, edit, and propagate the cluster configuration file (`/etc/cluster/cluster.conf`). The **Cluster Status Tool** provides the capability to manage high-availability services. The following sections summarize those functions.

While `system-config-cluster` provides several convenient tools for configuring and managing a Red Hat Cluster, the newer, more comprehensive tool, **Conga**, provides more convenience and flexibility than `system-config-cluster`.

3.1. Cluster Configuration Tool

You can access the **Cluster Configuration Tool** (*Figure 1.6, "**Cluster Configuration Tool**"*) through the **Cluster Configuration** tab in the Cluster Administration GUI.

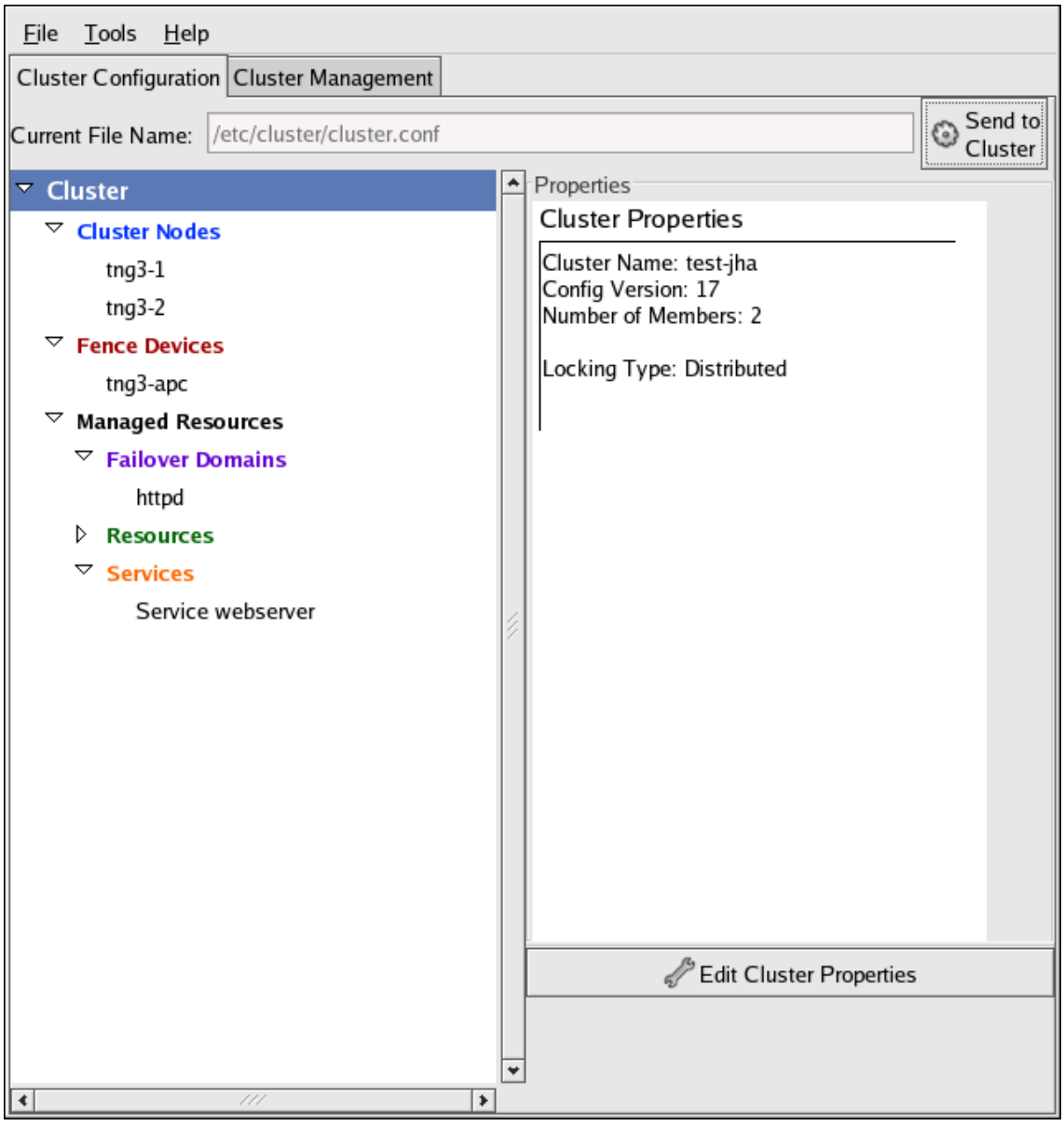

Figure 1.6. Cluster Configuration Tool

The **Cluster Configuration Tool** represents cluster configuration components in the configuration file (`/etc/cluster/cluster.conf`) with a hierarchical graphical display in the left panel. A triangle icon to the left of a component name indicates that the component has one or more subordinate components assigned to it. Clicking the triangle icon expands and collapses the portion of the tree below a component. The components displayed in the GUI are summarized as follows:

- **Cluster Nodes** — Displays cluster nodes. Nodes are represented by name as subordinate elements under **Cluster Nodes**. Using configuration buttons at the bottom of the right frame (below **Properties**), you can add nodes, delete nodes, edit node properties, and configure fencing methods for each node.
- **Fence Devices** — Displays fence devices. Fence devices are represented as subordinate elements under **Fence Devices**. Using configuration buttons at the bottom of the right frame (below **Properties**), you can add fence devices, delete fence devices, and edit fence-device properties. Fence devices must be defined before you can configure fencing (with the **Manage Fencing For This Node** button) for each node.
- **Managed Resources** — Displays failover domains, resources, and services.
  - **Failover Domains** — For configuring one or more subsets of cluster nodes used to run a high-availability service in the event of a node failure. Failover domains are represented as subordinate elements under **Failover Domains**. Using configuration buttons at the bottom of the right frame (below **Properties**), you can create failover domains (when **Failover Domains** is selected) or edit failover domain properties (when a failover domain is selected).
  - **Resources** — For configuring shared resources to be used by high-availability services. Shared resources consist of file systems, IP addresses, NFS mounts and exports, and user-created scripts that are available to any high-availability service in the cluster. Resources are represented as subordinate elements under **Resources**. Using configuration buttons at the bottom of the right frame (below **Properties**), you can create resources (when **Resources** is selected) or edit resource properties (when a resource is selected).

Note

The **Cluster Configuration Tool** provides the capability to configure private resources, also. A private resource is a resource that is configured for use with only one service. You can configure a private resource within a **Service** component in the GUI.

- **Services** — For creating and configuring high-availability services. A service is configured by assigning resources (shared or private), assigning a failover domain, and defining a recovery policy for the service. Services are represented as subordinate elements under

Services. Using configuration buttons at the bottom of the right frame (below **Properties**), you can create services (when **Services** is selected) or edit service properties (when a service is selected).

3.2. Cluster Status Tool

You can access the **Cluster Status Tool** (*Figure 1.7, "**Cluster Status Tool**"*) through the **Cluster Management** tab in Cluster Administration GUI.

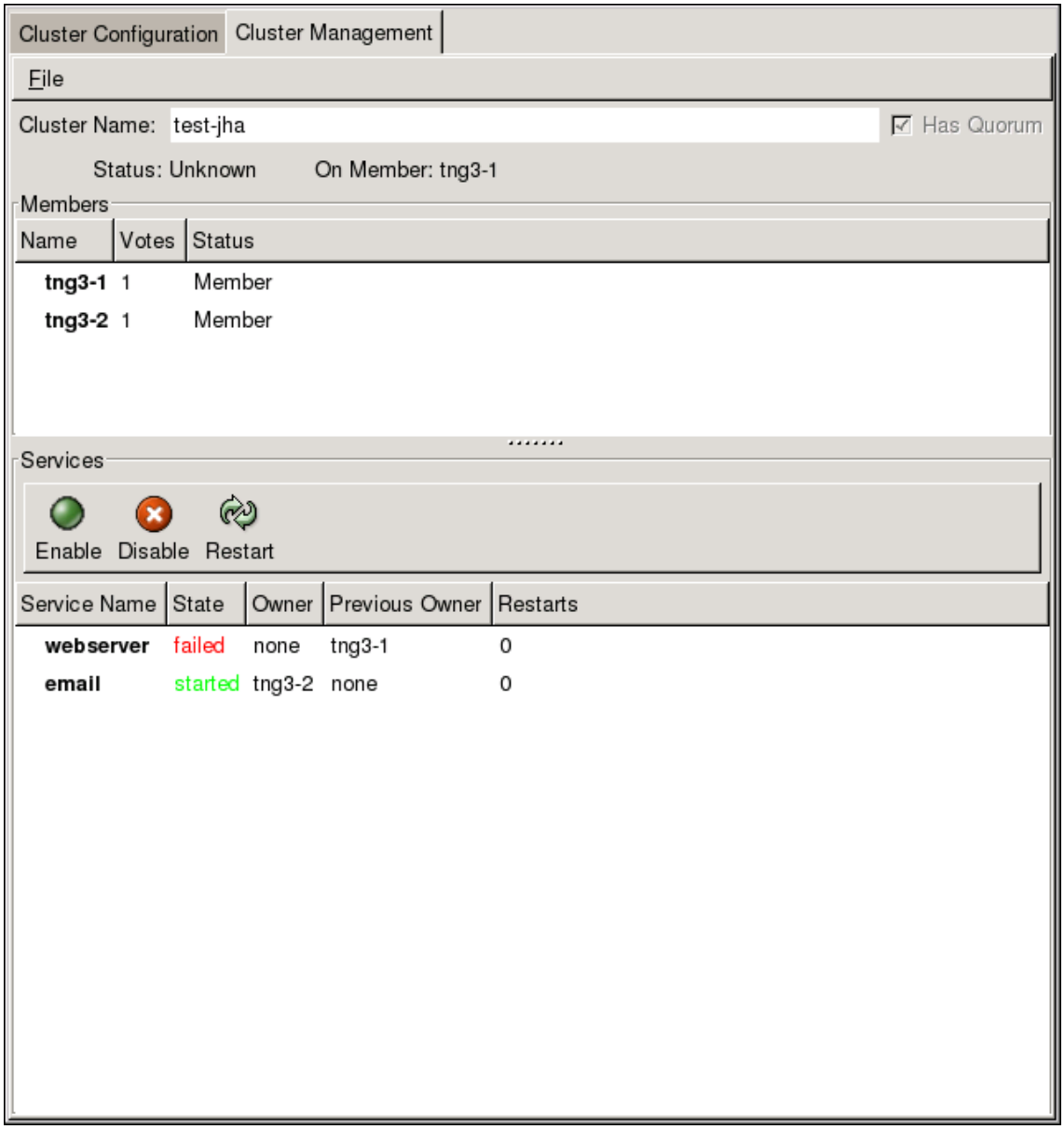

Figure 1.7. Cluster Status Tool

The nodes and services displayed in the **Cluster Status Tool** are determined by the cluster configuration file (`/etc/cluster/cluster.conf`). You can use the **Cluster Status Tool** to enable, disable, restart, or relocate a high-availability service.

4. Command Line Administration Tools

In addition to **Conga** and the `system-config-cluster` Cluster Administration GUI, command line tools are available for administering the cluster infrastructure and the high-availability service management components. The command line tools are used by the Cluster Administration GUI and init scripts supplied by Red Hat. *Table 1.1, "Command Line Tools"* summarizes the command line tools.

Command Line Tool	Used With	Purpose
`ccs_tool` — Cluster Configuration System Tool	Cluster Infrastructure	`ccs_tool` is a program for making online updates to the cluster configuration file. It provides the capability to create and modify cluster infrastructure components (for example, creating a cluster, adding and removing a node). For more information about this tool, refer to the ccs_tool(8) man page.
`cman_tool` — Cluster Management Tool	Cluster Infrastructure	`cman_tool` is a program that manages the CMAN cluster manager. It provides the capability to join a cluster, leave a cluster, kill a node, or change the expected quorum votes of a node in a cluster. `cman_tool` is available with DLM clusters only. For more information about this tool, refer to the cman_tool(8) man page.
`gulm_tool` — Cluster Management Tool	Cluster Infrastructure	`gulm_tool` is a program used to manage GULM. It provides an interface to `lock_gulmd`, the GULM lock manager. `gulm_tool` is available with GULM clusters only. For more information about this tool, refer to the gulm_tool(8) man page.
`fence_tool` — Fence Tool	Cluster Infrastructure	`fence_tool` is a program used to join or leave the default fence domain. Specifically, it starts the fence daemon (`fenced`) to join the domain and kills `fenced` to leave the domain. `fence_tool` is available with DLM clusters only. For more information about this tool, refer to the fence_tool(8) man page.
`clustat` — Cluster Status Utility	High-availability Service Management Components	The `clustat` command displays the status of the cluster. It shows membership information, quorum view, and the state of all configured user services. For more information about this tool, refer to the clustat(8) man page.
`clusvcadm` —	High-availability	The `clusvcadm` command allows you to enable,

Command Line Tool	Used With	Purpose
Cluster User Service Administration Utility	Service Management Components	disable, relocate, and restart high-availability services in a cluster. For more information about this tool, refer to the clusvcadm(8) man page.

Table 1.1. Command Line Tools

Before Configuring a Red Hat Cluster

This chapter describes tasks to perform and considerations to make before installing and configuring a Red Hat Cluster, and consists of the following sections:

- *Section 1, "Compatible Hardware"*
- *Section 2, "Enabling IP Ports"*
- *Section 3, "Configuring ACPI For Use with Integrated Fence Devices"*
- *Section 4, "Configuring max_luns"*
- *Section 5, "Considerations for Using Quorum Disk"*
- *Section 7, "Considerations for Using **Conga**"*
- *Section 8, "General Configuration Considerations"*

1. Compatible Hardware

Before configuring Red Hat Cluster software, make sure that your cluster uses appropriate hardware (for example, supported fence devices, storage devices, and Fibre Channel switches). Refer to the hardware configuration guidelines at *http://www.redhat.com/cluster_suite/hardware/* for the most current hardware compatibility information.

2. Enabling IP Ports

Before deploying a Red Hat Cluster, you must enable certain IP ports on the cluster nodes and on computers that run **luci** (the Conga user interface server). The following sections specify the IP ports to be enabled and provide examples of `iptables` rules for enabling the ports:

- *Section 2.1, "Enabling IP Ports on Cluster Nodes"*
- *Section 2.2, "Enabling IP Ports on Computers That Run **luci**"*
- *Section 2.3, "Examples of `iptables` Rules"*

2.1. Enabling IP Ports on Cluster Nodes

To allow Red Hat Cluster nodes to communicate with each other, you must enable the IP ports assigned to certain Red Hat Cluster components. *Table 2.1, "Enabled IP Ports on Red Hat Cluster Nodes"* lists the IP port numbers, their respective protocols, the components to which

the port numbers are assigned, and references to `iptables` rule examples. At each cluster node, enable IP ports according to *Table 2.1, "Enabled IP Ports on Red Hat Cluster Nodes"*. (All examples are in *Section 2.3, "Examples of `iptables` Rules"*.)

IP Port Number	Protocol	Component	Reference to Example of `iptables` Rules
6809	UDP	`cman` (Cluster Manager), for use in clusters with Distributed Lock Manager (DLM) selected	*Example 2.1, "Port 6809: cman"*
11111	TCP	`ricci` (part of Conga remote agent)	*Example 2.3, "Port 11111: ricci (Cluster Node and Computer Running **luci**)"*
14567	TCP	`gnbd` (Global Network Block Device)	*Example 2.4, "Port 14567: gnbd"*
16851	TCP	`modclusterd` (part of Conga remote agent)	*Example 2.5, "Port 16851: modclusterd"*
21064	TCP	`dlm` (Distributed Lock Manager), for use in clusters with Distributed Lock Manager (DLM) selected	*Example 2.6, "Port 21064: dlm"*
40040, 40042, 41040	TCP	`lock_gulmd` (GULM daemon), for use in clusters with Grand Unified Lock Manager (GULM) selected	*Example 2.7, "Ports 40040, 40042, 41040: lock_gulmd"*
41966, 41967, 41968, 41969	TCP	`rgmanager` (high-availability service management)	*Example 2.8, "Ports 41966, 41967, 41968, 41969: rgmanager"*
50006, 50008, 50009	TCP	`ccsd` (Cluster Configuration System daemon)	*Example 2.9, "Ports 50006, 50008, 50009: ccsd (TCP)"*
50007	UDP	`ccsd` (Cluster Configuration System daemon)	*Example 2.10, "Port 50007: ccsd (UDP)"*

Table 2.1. Enabled IP Ports on Red Hat Cluster Nodes

2.2. Enabling IP Ports on Computers That Run luci

To allow client computers to communicate with a computer that runs **luci** (the **Conga** user interface server), and to allow a computer that runs **luci** to communicate with **ricci** in the cluster nodes, you must enable the IP ports assigned to **luci** and **ricci**. *Table 2.2, "Enabled IP Ports on a Computer That Runs **luci**"* lists the IP port numbers, their respective protocols, the components to which the port numbers are assigned, and references to `iptables` rule examples. At each computer that runs **luci**, enable IP ports according to *Table 2.1, "Enabled IP Ports on Red Hat Cluster Nodes"*. (All examples are in *Section 2.3, "Examples of `iptables`*

Rules".)

Note

If a cluster node is running **luci**, port 11111 should already have been enabled.

IP Port Number	Protocol	Component	Reference to Example of iptables Rules
8084	TCP	**luci** (Conga user interface server)	*Example 2.2, "Port 8084: luci (Cluster Node or Computer Running **luci**)"*
11111	TCP	ricci (Conga remote agent)	*Example 2.3, "Port 11111: ricci (Cluster Node and Computer Running **luci**)"*

Table 2.2. Enabled IP Ports on a Computer That Runs luci

2.3. Examples of iptables Rules

This section provides iptables rule examples for enabling IP ports on Red Hat Cluster nodes and computers that run **luci**. The examples enable IP ports for a computer having an IP address of 10.10.10.200, using a subnet mask of 10.10.10.0/24.

Note

Examples are for cluster nodes unless otherwise noted in the example titles.

```
-A INPUT -i 10.10.10.200 -m state --state NEW -p udp -s 10.10.10.0/24 -d
10.10.10.0/24 --dport 6809 -j ACCEPT
```

Example 2.1. Port 6809: cman

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 8084 -j ACCEPT
```

Example 2.2. Port 8084: luci (Cluster Node or Computer Running luci)

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 11111 -j ACCEPT
```

Example 2.3. Port 11111: ricci (Cluster Node and Computer Running luci)

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 14567 -j ACCEPT
```

Example 2.4. Port 14567: gnbd

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 16851 -j ACCEPT
```

Example 2.5. Port 16851: modclusterd

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 21064 -j ACCEPT
```

Example 2.6. Port 21064: dlm

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 40040,40042,41040 -j ACCEPT
```

Example 2.7. Ports 40040, 40042, 41040: lock_gulmd

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 41966,41967,41968,41969 -j ACCEPT
```

Example 2.8. Ports 41966, 41967, 41968, 41969: rgmanager

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p tcp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 50006,50008,50009 -j ACCEPT
```

Example 2.9. Ports 50006, 50008, 50009: ccsd (TCP)

```
-A INPUT -i 10.10.10.200 -m state --state NEW -m multiport -p udp -s
10.10.10.0/24 -d 10.10.10.0/24 --dports 50007 -j ACCEPT
```

Example 2.10. Port 50007: ccsd (UDP)

3. Configuring ACPI For Use with Integrated Fence Devices

If your cluster uses integrated fence devices, you must configure ACPI (Advanced Configuration and Power Interface) to ensure immediate and complete fencing.

Note

For the most current information about integrated fence devices supported by Red Hat Cluster Suite, refer to *http://www.redhat.com/cluster_suite/hardware/*.

If a cluster node is configured to be fenced by an integrated fence device, disable ACPI Soft-Off for that node. Disabling ACPI Soft-Off allows an integrated fence device to turn off a node immediately and completely rather than attempting a clean shutdown (for example, `shutdown -h now`). Otherwise, if ACPI Soft-Off is enabled, an integrated fence device can take four or more seconds to turn off a node (refer to note that follows). In addition, if ACPI Soft-Off is enabled and a node panics or freezes during shutdown, an integrated fence device may not be able to turn off the node. Under those circumstances, fencing is delayed or unsuccessful. Consequently, when a node is fenced with an integrated fence device and ACPI Soft-Off is enabled, a cluster recovers slowly or requires administrative intervention to recover.

Note

The amount of time required to fence a node depends on the integrated fence device used. Some integrated fence devices perform the equivalent of pressing and holding the power button; therefore, the fence device turns off the node in four to five seconds. Other integrated fence devices perform the equivalent of

pressing the power button momentarily, relying on the operating system to turn off the node; therefore, the fence device turns off the node in a time span much longer than four to five seconds.

To disable ACPI Soft-Off, use `chkconfig` management and verify that the node turns off immediately when fenced. The preferred way to disable ACPI Soft-Off is with `chkconfig` management: however, if that method is not satisfactory for your cluster, you can disable ACPI Soft-Off with one of the following alternate methods:

- Changing the BIOS setting to "instant-off" or an equivalent setting that turns off the node without delay

Note

Disabling ACPI Soft-Off with the BIOS may not be possible with some computers.

- Appending **`acpi=off`** to the kernel boot command line of the `/boot/grub/grub.conf` file

Important

This method completely disables ACPI; some computers do not boot correctly if ACPI is completely disabled. Use this method *only* if the other methods are not effective for your cluster.

The following sections provide procedures for the preferred method and alternate methods of disabling ACPI Soft-Off:

- *Section 3.1, "Disabling ACPI Soft-Off with `chkconfig` Management"* — Preferred method
- *Section 3.2, "Disabling ACPI Soft-Off with the BIOS"* — First alternate method
- *Section 3.3, "Disabling ACPI Completely in the `grub.conf` File"* — Second alternate method

3.1. Disabling ACPI Soft-Off with `chkconfig` Management

You can use `chkconfig` management to disable ACPI Soft-Off either by removing the ACPI daemon (`acpid`) from `chkconfig` management or by turning off `acpid`.

Note

This is the preferred method of disabling ACPI Soft-Off.

Disable ACPI Soft-Off with `chkconfig` management at each cluster node as follows:

1. Run either of the following commands:
   - `chkconfig --del acpid` — This command removes `acpid` from `chkconfig` management.

     — OR —

   - `chkconfig --level 2345 acpid off` — This command turns off `acpid`.
2. Reboot the node.
3. When the cluster is configured and running, verify that the node turns off immediately when fenced.

Tip

You can fence the node with the `fence_node` command or **Conga**.

3.2. Disabling ACPI Soft-Off with the BIOS

The preferred method of disabling ACPI Soft-Off is with `chkconfig` management (*Section 3.1, "Disabling ACPI Soft-Off with `chkconfig` Management"*). However, if the preferred method is not effective for your cluster, follow the procedure in this section.

Note

Disabling ACPI Soft-Off with the BIOS may not be possible with some computers.

You can disable ACPI Soft-Off by configuring the BIOS of each cluster node as follows:

1. Reboot the node and start the `BIOS CMOS Setup Utility` program.
2. Navigate to the **Power** menu (or equivalent power management menu).

3. At the **Power** menu, set the **Soft-Off by PWR-BTTN** function (or equivalent) to **Instant-Off** (or the equivalent setting that turns off the node via the power button without delay). *Example 2.11, "`BIOS CMOS Setup Utility`: **Soft-Off by PWR-BTTN** set to **Instant-Off**"* shows a **Power** menu with **ACPI Function** set to **Enabled** and **Soft-Off by PWR-BTTN** set to **Instant-Off**.

Note

The equivalents to **ACPI Function**, **Soft-Off by PWR-BTTN**, and **Instant-Off** may vary among computers. However, the objective of this procedure is to configure the BIOS so that the computer is turned off via the power button without delay.

4. Exit the `BIOS CMOS Setup Utility` program, saving the BIOS configuration.

5. When the cluster is configured and running, verify that the node turns off immediately when fenced.

Tip

You can fence the node with the `fence_node` command or **Conga**.

```
+-------------------------------------------------|------------------------+
|    ACPI Function              [Enabled]         |         Item Help      |
|    ACPI Suspend Type          [S1(POS)]         |------------------------|
|  x Run VGABIOS if S3 Resume    Auto             | Menu Level   *         |
|    Suspend Mode               [Disabled]        |                        |
|    HDD Power Down             [Disabled]        |                        |
|    Soft-Off by PWR-BTTN       [Instant-Off]     |                        |
|    CPU THRM-Throttling        [50.0%]           |                        |
|    Wake-Up by PCI card        [Enabled]         |                        |
|    Power On by Ring           [Enabled]         |                        |
|    Wake Up On LAN             [Enabled]         |                        |
|  x USB KB Wake-Up From S3      Disabled         |                        |
|    Resume by Alarm            [Disabled]        |                        |
|  x  Date(of Month) Alarm       0                |                        |
|  x  Time(hh:mm:ss) Alarm       0 :  0 :  0      |                        |
|    POWER ON Function          [BUTTON ONLY]     |                        |
|  x KB Power ON Password        Enter            |                        |
|  x Hot Key Power ON            Ctrl-F1          |                        |
|                                                 |                        |
|                                                 |                        |
+-------------------------------------------------|------------------------+
```

This example shows **ACPI Function** set to **Enabled**, and **Soft-Off by PWR-BTTN** set to **Instant-Off**.

Example 2.11. BIOS CMOS Setup Utility: Soft-Off by PWR-BTTN set to Instant-Off

3.3. Disabling ACPI Completely in the grub.conf File

The preferred method of disabling ACPI Soft-Off is with chkconfig management (*Section 3.1, "Disabling ACPI Soft-Off with chkconfig Management"*). If the preferred method is not effective for your cluster, you can disable ACPI Soft-Off with the BIOS power management (*Section 3.2, "Disabling ACPI Soft-Off with the BIOS"*). If neither of those methods is effective for your cluster, you can disable ACPI completely by appending **acpi=off** to the kernel boot command line in the grub.conf file.

Important

This method completely disables ACPI; some computers do not boot correctly if ACPI is completely disabled. Use this method *only* if the other methods are not effective for your cluster.

You can disable ACPI completely by editing the grub.conf file of each cluster node as follows:

1. Open /boot/grub/grub.conf with a text editor.
2. Append **acpi=off** to the kernel boot command line in /boot/grub/grub.conf (refer to *Example 2.12, "Kernel Boot Command Line with **acpi=off** Appended to It"*).
3. Reboot the node.
4. When the cluster is configured and running, verify that the node turns off immediately when fenced.

Tip

You can fence the node with the fence_node command or **Conga**.

```
# grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
```

```
# NOTICE:  You have a /boot partition.  This means that
#          all kernel and initrd paths are relative to /boot/, eg.
#          root (hd0,0)
#          kernel /vmlinuz-version ro root=/dev/VolGroup00/LogVol00
#          initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=5
serial --unit=0 --speed=115200
terminal --timeout=5 serial console
title Red Hat Enterprise Linux Server (2.6.18-36.el5)
        root (hd0,0)
        kernel /vmlinuz-2.6.18-36.el5 ro root=/dev/VolGroup00/LogVol00
console=ttyS0,115200n8 acpi=off
        initrd /initrd-2.6.18-36.el5.img
```

In this example, **acpi=off** has been appended to the kernel boot command line — the line starting with "kernel /vmlinuz-2.6.18-36.el5".

Example 2.12. Kernel Boot Command Line with `acpi=off` Appended to It

4. Configuring max_luns

If RAID storage in your cluster presents multiple LUNs (Logical Unit Numbers), each cluster node must be able to access those LUNs. To enable access to all LUNs presented, configure `max_luns` in the `/etc/modprobe.conf` file of each node as follows:

1. Open `/etc/modprobe.conf` with a text editor.
2. Append the following line to `/etc/modprobe.conf`. Set *`N`* to the highest numbered LUN that is presented by RAID storage.

```
options scsi_mod max_luns=N
```

   For example, with the following line appended to the `/etc/modprobe.conf` file, a node can access LUNs numbered as high as 255:

```
options scsi_mod max_luns=255
```

3. Save `/etc/modprobe.conf`.
4. Run `mkinitrd` to rebuild `initrd` for the currently running kernel as follows. Set the *`kernel`* variable to the currently running kernel:

```
# cd /boot
# mkinitrd -f -v initrd-kernel.img kernel
```

For example, the currently running kernel in the following `mkinitrd` command is 2.6.9-34.0.2.EL:

```
# mkinitrd -f -v initrd-2.6.9-34.0.2.EL.img 2.6.9-34.0.2.EL
```

Tip

You can determine the currently running kernel by running `uname -r`.

5. Restart the node.

5. Considerations for Using Quorum Disk

Quorum Disk is a disk-based quorum daemon, `qdiskd`, that provides supplemental heuristics to determine node fitness. With heuristics you can determine factors that are important to the operation of the node in the event of a network partition. For example, in a four-node cluster with a 3:1 split, ordinarily, the three nodes automatically "win" because of the three-to-one majority. Under those circumstances, the one node is fenced. With `qdiskd` however, you can set up heuristics that allow the one node to win based on access to a critical resource (for example, a critical network path). If your cluster requires additional methods of determining node health, then you should configure `qdiskd` to meet those needs.

Note

Configuring `qdiskd` is not required unless you have special requirements for node health. An example of a special requirement is an "all-but-one" configuration. In an all-but-one configuration, `qdiskd` is configured to provide enough quorum votes to maintain quorum even though only one node is working.

Important

Overall, heuristics and other `qdiskd` parameters for your Red Hat Cluster

depend on the site environment and special requirements needed. To understand the use of heuristics and other `qdiskd` parameters, refer to the qdisk(5) man page. If you require assistance understanding and using `qdiskd` for your site, contact an authorized Red Hat support representative.

If you need to use `qdiskd`, you should take into account the following considerations:

Cluster node votes
: Each cluster node should have the same number of votes.

CMAN membership timeout value
: The CMAN membership timeout value (the time a node needs to be unresponsive before CMAN considers that node to be dead, and not a member) should be at least two times that of the `qdiskd` membership timeout value. The reason is because the quorum daemon must detect failed nodes on its own, and can take much longer to do so than CMAN. The default value for CMAN membership timeout is 10 seconds. Other site-specific conditions may affect the relationship between the membership timeout values of CMAN and `qdiskd`. For assistance with adjusting the CMAN membership timeout value, contact an authorized Red Hat support representative.

Fencing
: To ensure reliable fencing when using `qdiskd`, use power fencing. While other types of fencing (such as watchdog timers and software-based solutions to reboot a node internally) can be reliable for clusters not configured with `qdiskd`, they are not reliable for a cluster configured with `qdiskd`.

Maximum nodes
: A cluster configured with `qdiskd` supports a maximum of 16 nodes. The reason for the limit is because of scalability; increasing the node count increases the amount of synchronous I/O contention on the shared quorum disk device.

Quorum disk device
: A quorum disk device should be a shared block device with concurrent read/write access by all nodes in a cluster. The minimum size of the block device is 10 Megabytes. Examples of shared block devices that can be used by `qdiskd` are a multi-port SCSI RAID array, a Fibre Channel RAID SAN, or a RAID-configured iSCSI target. You can create a quorum disk device with `mkqdisk`, the Cluster Quorum Disk Utility. For information about using the utility refer to the mkqdisk(8) man page.

Note

Using JBOD as a quorum disk is not recommended. A JBOD cannot provide dependable performance and therefore may not allow a node to write to it quickly

enough. If a node is unable to write to a quorum disk device quickly enough, the node is falsely evicted from a cluster.

6. Red Hat Cluster Suite and SELinux

Red Hat Cluster Suite for Red Hat Enterprise Linux 4 requires that SELinux be disabled. Before configuring a Red Hat cluster, make sure to disable SELinux. For example, you can disable SELinux upon installation of Red Hat Enterprise Linux 4 or you can specify **`SELINUX=disabled`** in the `/etc/selinux/config` file.

7. Considerations for Using Conga

When using **Conga** to configure and manage your Red Hat Cluster, make sure that each computer running **luci** (the **Conga** user interface server) is running on the same network that the cluster is using for cluster communication. Otherwise, **luci** cannot configure the nodes to communicate on the right network. If the computer running **luci** is on another network (for example, a public network rather than a private network that the cluster is communicating on), contact an authorized Red Hat support representative to make sure that the appropriate host name is configured for each cluster node.

8. General Configuration Considerations

You can configure a Red Hat Cluster in a variety of ways to suit your needs. Take into account the following considerations when you plan, configure, and implement your Red Hat Cluster.

No-single-point-of-failure hardware configuration
: Clusters can include a dual-controller RAID array, multiple bonded network channels, multiple paths between cluster members and storage, and redundant un-interruptible power supply (UPS) systems to ensure that no single failure results in application down time or loss of data.

  Alternatively, a low-cost cluster can be set up to provide less availability than a no-single-point-of-failure cluster. For example, you can set up a cluster with a single-controller RAID array and only a single Ethernet channel.

  Certain low-cost alternatives, such as host RAID controllers, software RAID without cluster support, and multi-initiator parallel SCSI configurations are not compatible or appropriate for use as shared cluster storage.

Data integrity assurance
: To ensure data integrity, only one node can run a cluster service and access cluster-service data at a time. The use of power switches in the cluster hardware configuration enables a node to power-cycle another node before restarting that node's cluster services during a

failover process. This prevents two nodes from simultaneously accessing the same data and corrupting it. It is strongly recommended that *fence devices* (hardware or software solutions that remotely power, shutdown, and reboot cluster nodes) are used to guarantee data integrity under all failure conditions. Watchdog timers provide an alternative way to to ensure correct operation of cluster service failover.

Ethernet channel bonding

Cluster quorum and node health is determined by communication of messages among cluster nodes via Ethernet. In addition, cluster nodes use Ethernet for a variety of other critical cluster functions (for example, fencing). With Ethernet channel bonding, multiple Ethernet interfaces are configured to behave as one, reducing the risk of a single-point-of-failure in the typical switched Ethernet connection among cluster nodes and other cluster hardware.

Configuring Red Hat Cluster With Conga

This chapter describes how to configure Red Hat Cluster software using **Conga**, and consists of the following sections:

- *Section 1, “Configuration Tasks”*
- *Section 2, “Starting **luci** and **ricci**”*.
- *Section 3, “Creating A Cluster”*
- *Section 4, “Global Cluster Properties”*
- *Section 5, “Configuring Fence Devices”*
- *Section 6, “Configuring Cluster Members”*
- *Section 7, “Configuring a Failover Domain”*
- *Section 8, “Adding Cluster Resources”*
- *Section 9, “Adding a Cluster Service to the Cluster”*
- *Section 10, “Configuring Cluster Storage”*

1. Configuration Tasks

Configuring Red Hat Cluster software with **Conga** consists of the following steps:

1. Configuring and running the **Conga** configuration user interface — the **luci** server. Refer to *Section 2, “Starting **luci** and **ricci**”*.
2. Creating a cluster. Refer to *Section 3, “Creating A Cluster”*.
3. Configuring global cluster properties. Refer to *Section 4, “Global Cluster Properties”*.
4. Configuring fence devices. Refer to *Section 5, “Configuring Fence Devices”*.
5. Configuring cluster members. Refer to *Section 6, “Configuring Cluster Members”*.
6. Creating failover domains. Refer to *Section 7, “Configuring a Failover Domain”*.
7. Creating resources. Refer to *Section 8, “Adding Cluster Resources”*.
8. Creating cluster services. Refer to *Section 9, “Adding a Cluster Service to the Cluster”*.
9. Configuring storage. Refer to *Section 10, “Configuring Cluster Storage”*.

2. Starting luci and ricci

To administer Red Hat Clusters with **Conga**, install and run **luci** and **ricci** as follows:

1. At each node to be administered by **Conga**, install the **ricci** agent. For example:

```
# up2date -i ricci
```

2. At each node to be administered by **Conga**, start **ricci**. For example:

```
# service ricci start
Starting ricci:                                            [  OK  ]
```

3. Select a computer to host **luci** and install the **luci** software on that computer. For example:

```
# up2date -i luci
```

Note

Typically, a computer in a server cage or a data center hosts **luci**; however, a cluster computer can host **luci**.

4. At the computer running **luci**, initialize the **luci** server using the `luci_admin init` command. For example:

```
# luci_admin init
Initializing the Luci server


Creating the 'admin' user

Enter password:  <Type password and press ENTER.>
Confirm password: <Re-type password and press ENTER.>

Please wait...
The admin password has been successfully set.
Generating SSL certificates...
Luci server has been successfully initialized


Restart the Luci server for changes to take effect
eg. service luci restart
```

5. Start **luci** using `service luci restart`. For example:

```
# service luci restart
Shutting down luci:                                        [  OK  ]
Starting luci: generating https SSL certificates...  done
                                                           [  OK  ]

Please, point your web browser to https://nano-01:8084 to access luci
```

6. At a Web browser, place the URL of the **luci** server into the URL address box and click **Go** (or the equivalent). The URL syntax for the **luci** server is **`https://luci_server_hostname:8084`**. The first time you access **luci**, two SSL certificate dialog boxes are displayed. Upon acknowledging the dialog boxes, your Web browser displays the **luci** login page.

3. Creating A Cluster

Creating a cluster with **luci** consists of selecting cluster nodes, entering their passwords, and submitting the request to create a cluster. If the node information and passwords are correct, **Conga** automatically installs software into the cluster nodes and starts the cluster. Create a cluster as follows:

1. As administrator of **luci**, select the **cluster** tab.
2. Click **Create a New Cluster**.
3. At the **Cluster Name** text box, enter a cluster name. The cluster name cannot exceed 15 characters. Add the node name and password for each cluster node. Enter the node name for each node in the **Node Hostname** column; enter the root password for each node in the in the **Root Password** column. Check the **Enable Shared Storage Support** checkbox if clustered storage is required.
4. Click **Submit**. Clicking **Submit** causes the the **Create a new cluster** page to be displayed again, showing the parameters entered in the preceding step, and **Lock Manager** parameters. The **Lock Manager** parameters consist of the lock manager option buttons, **DLM (preferred)** and **GULM**, and **Lock Server** text boxes in the **GULM lock server properties** group box. Configure **Lock Manager** parameters for either DLM or GULM as follows:
   - For DLM — Click **DLM (preferred)** or confirm that it is set.
   - For GULM — Click **GULM** or confirm that it is set. At the **GULM lock server properties** group box, enter the FQDN or the IP address of each lock server in a **Lock Server** text box.

Note

You must enter the FQDN or the IP address of one, three, or five GULM lock servers.

5. Re-enter enter the root password for each node in the in the **Root Password** column.
6. Click **Submit**. Clicking **Submit** causes the following actions:
   a. Cluster software packages to be downloaded onto each cluster node.
   b. Cluster software to be installed onto each cluster node.
   c. Cluster configuration file to be created and propagated to each node in the cluster.
   d. Starting the cluster.

   A progress page shows the progress of those actions for each node in the cluster.

   When the process of creating a new cluster is complete, a page is displayed providing a configuration interface for the newly created cluster.

4. Global Cluster Properties

When a cluster is created, or if you select a cluster to configure, a cluster-specific page is displayed. The page provides an interface for configuring cluster-wide properties and detailed properties. You can configure cluster-wide properties with the tabbed interface below the cluster name. The interface provides the following tabs: **General**, **GULM** (GULM clusters only), **Fence** (DLM clusters only), **Multicast** (DLM clusters only), and **Quorum Partition** (DLM clusters only). To configure the parameters in those tabs, follow the steps in this section. If you do not need to configure parameters in a tab, skip the step for that tab.

1. **General** tab — This tab displays cluster name and provides an interface for configuring the configuration version and advanced cluster properties. The parameters are summarized as follows:
   - The **Cluster Name** text box displays the cluster name; it does not accept a cluster name change. You cannot change the cluster name. The only way to change the name of a Red Hat cluster is to create a new cluster configuration with the new name.
   - The **Configuration Version** value is set to **1** by default and is automatically incremented each time you modify your cluster configuration. However, if you need to set it to another value, you can specify it at the **Configuration Version** text box.

- You can enter advanced cluster properties by clicking **Show advanced cluster properties**. Clicking **Show advanced cluster properties** reveals a list of advanced properties. You can click any advanced property for online help about the property.

Enter the values required and click **Apply** for changes to take effect.

2. **Fence** tab (DLM clusters only) — This tab provides an interface for configuring these **Fence Daemon Properties** parameters: **Post-Fail Delay** and **Post-Join Delay**. The parameters are summarized as follows:

   - The **Post-Fail Delay** parameter is the number of seconds the fence daemon (`fenced`) waits before fencing a node (a member of the fence domain) after the node has failed. The **Post-Fail Delay** default value is **`0`**. Its value may be varied to suit cluster and network performance.

   - The **Post-Join Delay** parameter is the number of seconds the fence daemon (`fenced`) waits before fencing a node after the node joins the fence domain. The **Post-Join Delay** default value is **`3`**. A typical setting for **Post-Join Delay** is between 20 and 30 seconds, but can vary according to cluster and network performance.

   Enter values required and Click **Apply** for changes to take effect.

Note

For more information about **Post-Join Delay** and **Post-Fail Delay**, refer to the fenced(8) man page.

3. **GULM** tab (GULM clusters only) — This tab provides an interface for configuring GULM lock servers. The tab indicates each node in a cluster that is configured as a GULM lock server and provides the capability to change lock servers. Follow the rules provided at the tab for configuring GULM lock servers and click **Apply** for changes to take effect.

Important

The number of nodes that can be configured as GULM lock servers is limited to either one, three, or five.

4. **Multicast** tab (DLM clusters only) — This tab provides an interface for configuring these **Multicast Configuration** parameters: **Do not use multicast** and **Use multicast**. **Multicast Configuration** specifies whether a multicast address is used for cluster management communication among cluster nodes. **Do not use multicast** is the default setting. To use a multicast address for cluster management communication among cluster nodes, click **Use multicast**. When **Use multicast** is selected, the **Multicast address** and **Multicast network**

interface text boxes are enabled. If **Use multicast** is selected, enter the multicast address into the **Multicast address** text box and the multicast network interface into the **Multicast network interface** text box. Click **Apply** for changes to take effect.

5. **Quorum Partition** tab (DLM clusters only) — This tab provides an interface for configuring these **Quorum Partition Configuration** parameters: **Do not use a Quorum Partition**, **Use a Quorum Partition**, **Interval**, **Votes**, **TKO**, **Minimum Score**, **Device**, **Label**, and **Heuristics**. The **Do not use a Quorum Partition** parameter is enabled by default. *Table 3.1, "Quorum-Disk Parameters"* describes the parameters. If you need to use a quorum disk, click **Use a Quorum Partition**, enter quorum disk parameters, click **Apply**, and restart the cluster for the changes to take effect.

Important

Quorum-disk parameters and heuristics depend on the site environment and the special requirements needed. To understand the use of quorum-disk parameters and heuristics, refer to the qdisk(5) man page. If you require assistance understanding and using quorum disk, contact an authorized Red Hat support representative.

Note

Clicking **Apply** on the **Quorum Partition** tab propagates changes to the cluster configuration file (`/etc/cluster/cluster.conf`) in each cluster node. However, for the quorum disk to operate, you must restart the cluster (refer to *Section 1, "Starting, Stopping, and Deleting Clusters"*).

Parameter	Description
Do not use a Quorum Partition	Disables quorum partition. Disables quorum-disk parameters in the **Quorum Partition** tab.
Use a Quorum Partition	Enables quorum partition. Enables quorum-disk parameters in the **Quorum Partition** tab.
Interval	The frequency of read/write cycles, in seconds.
Votes	The number of votes the quorum daemon advertises to CMAN when it has a high enough score.
TKO	The number of cycles a node must miss to be declared dead.
Minimum Score	The minimum score for a node to be considered "alive". If omitted or set to 0, the default function, `floor((`*n*`+1)/2)`, is used, where *n* is the sum of the heuristics scores. The **Minimum Score** value must never exceed the sum of the heuristic scores; otherwise, the quorum disk

Parameter	Description
	cannot be available.
Device	The storage device the quorum daemon uses. The device must be the same on all nodes.
Label	Specifies the quorum disk label created by the `mkqdisk` utility. If this field contains an entry, the label overrides the **Device** field. If this field is used, the quorum daemon reads `/proc/partitions` and checks for qdisk signatures on every block device found, comparing the label against the specified label. This is useful in configurations where the quorum device name differs among nodes.
Heuristics	**Path to Program** — The program used to determine if this heuristic is alive. This can be anything that can be executed by `/bin/sh -c`. A return value of 0 indicates success; anything else indicates failure. This field is required. **Interval** — The frequency (in seconds) at which the heuristic is polled. The default interval for every heuristic is 2 seconds. **Score** — The weight of this heuristic. Be careful when determining scores for heuristics. The default score for each heuristic is 1.
Apply	Propagates the changes to the cluster configuration file (`/etc/cluster/cluster.conf`) in each cluster node.

Table 3.1. Quorum-Disk Parameters

5. Configuring Fence Devices

Configuring fence devices consists of creating, modifying, and deleting fence devices. Creating a fence device consists of selecting a fence device type and entering parameters for that fence device (for example, name, IP address, login, and password). Modifying a fence device consists of selecting an existing fence device and changing parameters for that fence device. Deleting a fence device consists of selecting an existing fence device and deleting it.

Tip

If you are creating a new cluster, you can create fence devices when you configure cluster nodes. Refer to *Section 6, "Configuring Cluster Members"*.

With **Conga** you can create shared and non-shared fence devices.

The following shared fence devices are available:

- APC Power Switch
- Brocade Fabric Switch
- Bull PAP
- Egenera SAN Controller
- GNBD
- IBM Blade Center
- McData SAN Switch
- QLogic SANbox2
- SCSI Fencing
- Virtual Machine Fencing
- Vixel SAN Switch
- WTI Power Switch

The following non-shared fence devices are available:

- Dell DRAC
- HP iLO
- IBM RSA II
- IPMI LAN
- RPS10 Serial Switch

This section provides procedures for the following tasks:

- Creating *shared* fence devices — Refer to *Section 5.1, "Creating a Shared Fence Device"*. The procedures apply *only* to creating shared fence devices. You can create *non-shared* (and shared) fence devices while configuring nodes (refer to *Section 6, "Configuring Cluster Members"*).
- Modifying or deleting fence devices — Refer to *Section 5.2, "Modifying or Deleting a Fence Device"*. The procedures apply to both shared and non-shared fence devices.

The starting point of each procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

5.1. Creating a Shared Fence Device

To create a shared fence device, follow these steps:

1. At the detailed menu for the cluster (below the **clusters** menu), click **Shared Fence Devices**. Clicking **Shared Fence Devices** causes the display of the fence devices for a cluster and causes the display of menu items for fence device configuration: **Add a Fence Device** and **Configure a Fence Device**.

Note

If this is an initial cluster configuration, no fence devices have been created, and therefore none are displayed.

2. Click **Add a Fence Device**. Clicking **Add a Fence Device** causes the **Add a Sharable Fence Device** page to be displayed (refer to *Figure 3.1, "Fence Device Configuration"*).

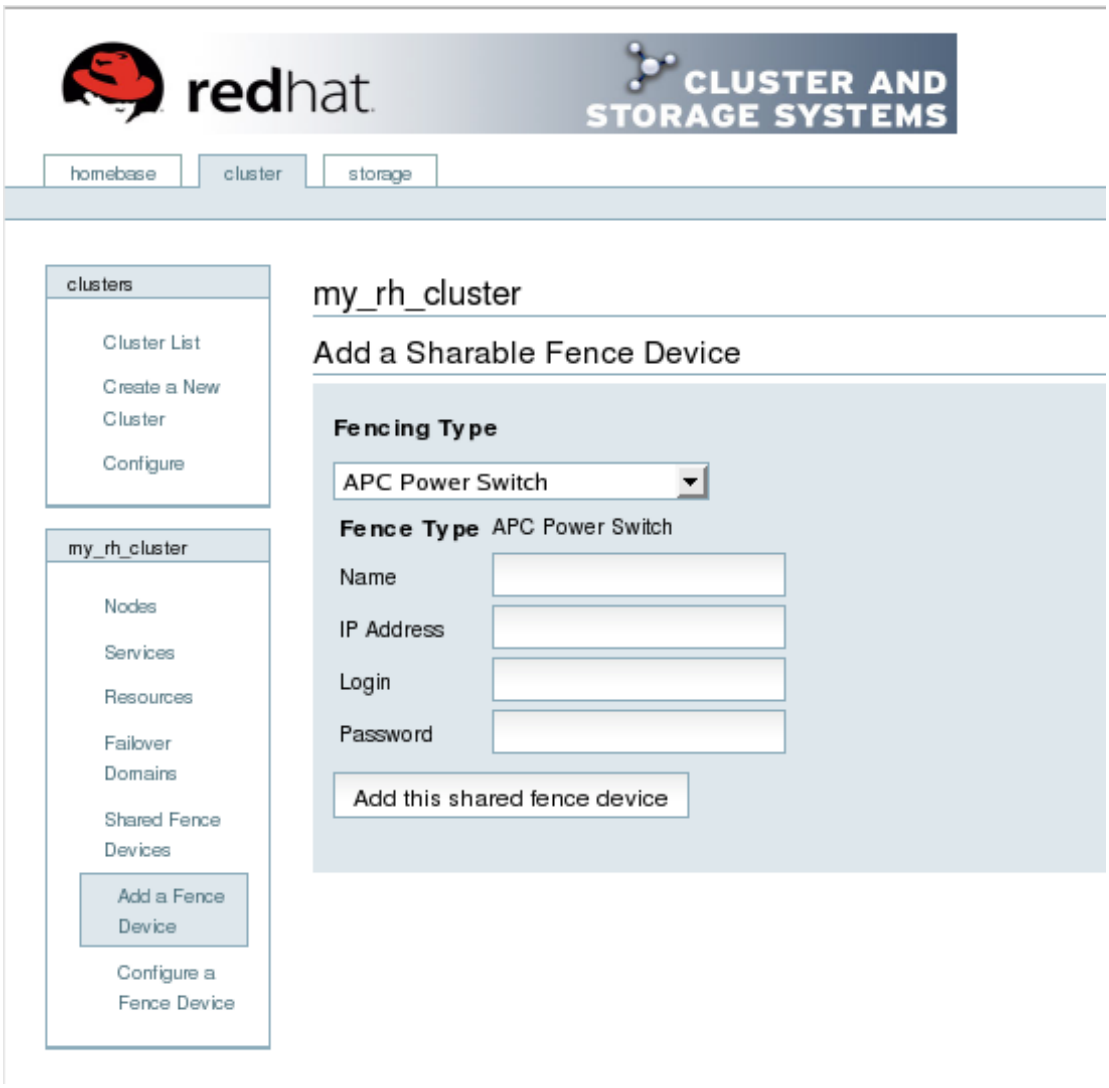

Figure 3.1. Fence Device Configuration

3. At the **Add a Sharable Fence Device** page, click the drop-down box under **Fencing Type** and select the type of fence device to configure.

4. Specify the information in the **Fencing Type** dialog box according to the type of fence device. Refer to *Appendix B, Fence Device Parameters* for more information about fence device parameters.

5. Click **Add this shared fence device**.

6. Clicking **Add this shared fence device** causes a progress page to be displayed temporarily. After the fence device has been added, the detailed cluster properties menu is updated with the fence device under **Configure a Fence Device**.

5.2. Modifying or Deleting a Fence Device

To modify or delete a fence device, follow these steps:

1. At the detailed menu for the cluster (below the **clusters** menu), click **Shared Fence Devices**. Clicking **Shared Fence Devices** causes the display of the fence devices for a cluster and causes the display of menu items for fence device configuration: **Add a Fence Device** and **Configure a Fence Device**.
2. Click **Configure a Fence Device**. Clicking **Configure a Fence Device** causes the display of a list of fence devices under **Configure a Fence Device**.
3. Click a fence device in the list. Clicking a fence device in the list causes the display of a **Fence Device Form** page for the fence device selected from the list.
4. Either modify or delete the fence device as follows:
   - To modify the fence device, enter changes to the parameters displayed. Refer to *Appendix B, Fence Device Parameters* for more information about fence device parameters. Click **Update this fence device** and wait for the configuration to be updated.
   - To delete the fence device, click **Delete this fence device** and wait for the configuration to be updated.

Note

You can create shared fence devices on the node configuration page, also. However, you can only modify or delete a shared fence device via **Shared Fence Devices** at the detailed menu for the cluster (below the **clusters** menu).

6. Configuring Cluster Members

Configuring cluster members consists of initially configuring nodes in a newly configured cluster, adding members, and deleting members. The following sections provide procedures for initial configuration of nodes, adding nodes, and deleting nodes:

- *Section 6.1, “Initially Configuring Members”*
- *Section 6.2, “Adding a Member to a Running Cluster”*
- *Section 6.3, “Deleting a Member from a Cluster”*

6.1. Initially Configuring Members

Creating a cluster consists of selecting a set of nodes (or members) to be part of the cluster. Once you have completed the initial step of creating a cluster and creating fence devices, you need to configure cluster nodes. To initially configure cluster nodes after creating a new cluster, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Nodes**. Clicking **Nodes** causes the display of an **Add a Node** element and a **Configure** element with a list of the nodes already configured in the cluster.
2. Click a link for a node at either the list in the center of the page or in the list in the detailed menu under the **clusters** menu. Clicking a link for a node causes a page to be displayed for that link showing how that node is configured.
3. At the bottom of the page, under **Main Fencing Method**, click **Add a fence device to this level**.
4. Select a fence device and provide parameters for the fence device (for example port number).

Note

You can choose from an existing fence device or create a new fence device.

5. Click **Update main fence properties** and wait for the change to take effect.

6.2. Adding a Member to a Running Cluster

To add a member to a running cluster, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Nodes**. Clicking **Nodes** causes the display of an **Add a Node** element and a **Configure** element with a list of the nodes already configured in the cluster. (In addition, a list of the cluster nodes is displayed in the center of the page.)
2. Click **Add a Node**. Clicking **Add a Node** causes the display of the **Add a node to *`cluster name`*** page.
3. At that page, enter the node name in the **Node Hostname** text box; enter the root password in the **Root Password** text box. Check the **Enable Shared Storage Support** checkbox if clustered storage is required. If you want to add more nodes, click **Add another entry** and enter node name and password for the each additional node.

4. Click **Submit**. Clicking **Submit** causes the following actions:

   a. Cluster software packages to be downloaded onto the added node.

   b. Cluster software to be installed (or verification that the appropriate software packages are installed) onto the added node.

   c. Cluster configuration file to be updated and propagated to each node in the cluster — including the added node.

   d. Joining the added node to cluster.

   A progress page shows the progress of those actions for each added node.

5. When the process of adding a node is complete, a page is displayed providing a configuration interface for the cluster.

6. At the detailed menu for the cluster (below the **clusters** menu), click **Nodes**. Clicking **Nodes** causes the following displays:

   - A list of cluster nodes in the center of the page
   - The **Add a Node** element and the **Configure** element with a list of the nodes configured in the cluster at the detailed menu for the cluster (below the **clusters** menu)

7. Click the link for an added node at either the list in the center of the page or in the list in the detailed menu under the **clusters** menu. Clicking the link for the added node causes a page to be displayed for that link showing how that node is configured.

8. At the bottom of the page, under **Main Fencing Method**, click **Add a fence device to this level**.

9. Select a fence device and provide parameters for the fence device (for example port number).

Note

You can choose from an existing fence device or create a new fence device.

10. Click **Update main fence properties** and wait for the change to take effect.

6.3. Deleting a Member from a Cluster

To delete a member from an existing cluster that is currently in operation, follow the steps in this section. The starting point of the procedure is at the **Choose a cluster to administer** page (displayed on the **cluster** tab).

1. Click the link of the node to be deleted. Clicking the link of the node to be deleted causes a page to be displayed for that link showing how that node is configured.

Note

To allow services running on a node to fail over when the node is deleted, skip the next step.

2. Disable or relocate each service that is running on the node to be deleted:

Note

Repeat this step for each service that needs to be disabled or started on another node.

   a. Under **Services on this Node**, click the link for a service. Clicking that link cause a configuration page for that service to be displayed.

   b. On that page, at the **Choose a task** drop-down box, choose to either disable the service are start it on another node and click **Go**.

   c. Upon confirmation that the service has been disabled or started on another node, click the **cluster** tab. Clicking the **cluster** tab causes the **Choose a cluster to administer** page to be displayed.

   d. At the **Choose a cluster to administer** page, click the link of the node to be deleted. Clicking the link of the node to be deleted causes a page to be displayed for that link showing how that node is configured.

3. On that page, at the **Choose a task** drop-down box, choose **Delete this node** and click **Go**. When the node is deleted, a page is displayed that lists the nodes in the cluster. Check the list to make sure that the node has been deleted.

7. Configuring a Failover Domain

A failover domain is a named subset of cluster nodes that are eligible to run a cluster service in the event of a node failure. A failover domain can have the following characteristics:

- Unrestricted — Allows you to specify that a subset of members are preferred, but that a cluster service assigned to this domain can run on any available member.
- Restricted — Allows you to restrict the members that can run a particular cluster service. If none of the members in a restricted failover domain are available, the cluster service cannot

be started (either manually or by the cluster software).

- Unordered — When a cluster service is assigned to an unordered failover domain, the member on which the cluster service runs is chosen from the available failover domain members with no priority ordering.
- Ordered — Allows you to specify a preference order among the members of a failover domain. The member at the top of the list is the most preferred, followed by the second member in the list, and so on.

Note

Changing a failover domain configuration has no effect on currently running services.

Note

Failover domains are *not* required for operation.

By default, failover domains are unrestricted and unordered.

In a cluster with several members, using a restricted failover domain can minimize the work to set up the cluster to run a cluster service (such as `httpd`), which requires you to set up the configuration identically on all members that run the cluster service). Instead of setting up the entire cluster to run the cluster service, you must set up only the members in the restricted failover domain that you associate with the cluster service.

Tip

To configure a preferred member, you can create an unrestricted failover domain comprising only one cluster member. Doing that causes a cluster service to run on that cluster member primarily (the preferred member), but allows the cluster service to fail over to any of the other members.

The following sections describe adding a failover domain and modifying a failover domain:

- *Section 7.1, “Adding a Failover Domain”*
- *Section 7.2, “Modifying a Failover Domain”*

7.1. Adding a Failover Domain

To add a failover domain, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Failover Domains**. Clicking **Failover Domains** causes the display of failover domains with related services and the display of menu items for failover domains: **Add a Failover Domain** and **Configure a Failover Domain** .
2. Click **Add a Failover Domain**. Clicking **Add a Failover Domain** causes the display of the **Add a Failover Domain** page.
3. At the **Add a Failover Domain** page, specify a failover domain name at the **Failover Domain Name** text box.

Note

The name should be descriptive enough to distinguish its purpose relative to other names used in your cluster.

4. To enable setting failover priority of the members in the failover domain, click the **Prioritized** checkbox. With **Prioritized** checked, you can set the priority value, **Priority**, for each node selected as members of the failover domain.
5. To restrict failover to members in this failover domain, click the checkbox next to **Restrict failover to this domain's members**. With **Restrict failover to this domain's members** checked, services assigned to this failover domain fail over only to nodes in this failover domain.
6. Configure members for this failover domain. Under **Failover domain membership**, click the **Member**checkbox for each node that is to be a member of the failover domain. If **Prioritized** is checked, set the priority in the **Priority** text box for each member of the failover domain.
7. Click **Submit**. Clicking **Submit** causes a progress page to be displayed followed by the display of the **Failover Domain Form** page. That page displays the added resource and includes the failover domain in the cluster menu to the left under **Domain**.
8. To make additional changes to the failover domain, continue modifications at the **Failover Domain Form** page and click **Submit** when you are done.

7.2. Modifying a Failover Domain

To modify a failover domain, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer**

displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Failover Domains**. Clicking **Failover Domains** causes the display of failover domains with related services and the display of menu items for failover domains: **Add a Failover Domain** and **Configure a Failover Domain** .
2. Click **Configure a Failover Domain**. Clicking **Configure a Failover Domain** causes the display of failover domains under **Configure a Failover Domain** at the detailed menu for the cluster (below the **clusters** menu).
3. At the detailed menu for the cluster (below the **clusters** menu), click the failover domain to modify. Clicking the failover domain causes the display of the **Failover Domain Form** page. At the **Failover Domain Form** page, you can modify the failover domain name, prioritize failover, restrict failover to this domain, and modify failover domain membership.
4. Modifying failover name — To change the failover domain name, modify the text at the **Failover Domain Name** text box.

Note

The name should be descriptive enough to distinguish its purpose relative to other names used in your cluster.

5. Failover priority — To enable or disable prioritized failover in this failover domain, click the **Prioritized** checkbox. With **Prioritized** checked, you can set the priority value, **Priority**, for each node selected as members of the failover domain. With **Prioritized***not* checked, setting priority levels is disabled for this failover domain.
6. Restricted failover — To enable or disable restricted failover for members in this failover domain, click the checkbox next to **Restrict failover to this domain's members**. With **Restrict failover to this domain's members** checked, services assigned to this failover domain fail over only to nodes in this failover domain. With **Restrict failover to this domain's members***not* checked, services assigned to this failover domain can fail over to nodes outside this failover domain.
7. Modifying failover domain membership — Under **Failover domain membership**, click the **Member**checkbox for each node that is to be a member of the failover domain. A checked box for a node means that the node is a member of the failover domain. If **Prioritized** is checked, you can adjust the priority in the **Priority** text box for each member of the failover domain.
8. Click **Submit**. Clicking **Submit** causes a progress page to be displayed followed by the display of the **Failover Domain Form** page. That page displays the added resource and includes the failover domain in the cluster menu to the left under **Domain**.

9. To make additional changes to the failover domain, continue modifications at the **Failover Domain Form** page and click **Submit** when you are done.

8. Adding Cluster Resources

To add a cluster resource, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Resources**. Clicking **Resources** causes the display of resources in the center of the page and causes the display of menu items for resource configuration: **Add a Resource** and **Configure a Resource**.
2. Click **Add a Resource**. Clicking **Add a Resource** causes the **Add a Resource** page to be displayed.
3. At the **Add a Resource** page, click the drop-down box under **Select a Resource Type** and select the type of resource to configure. The resource options are described as follows:

   GFS

   Name — Create a name for the file system resource.

   Mount Point — Choose the path to which the file system resource is mounted.

   Device — Specify the device file associated with the file system resource.

   Options — Mount options.

   File System ID — When creating a new file system resource, you can leave this field blank. Leaving the field blank causes a file system ID to be assigned automatically after you click **Submit** at the **File System Resource Configuration** dialog box. If you need to assign a file system ID explicitly, specify it in this field.

   Force Unmount checkbox — If checked, forces the file system to unmount. The default setting is unchecked. **Force Unmount** kills all processes using the mount point to free up the mount when it tries to unmount. With GFS resources, the mount point is *not* unmounted at service tear-down *unless* this box is checked.

   File System

   Name — Create a name for the file system resource.

   File System Type — Choose the file system for the resource using the drop-down menu.

   Mount Point — Choose the path to which the file system resource is mounted.

   Device — Specify the device file associated with the file system resource.

   Options — Mount options. system.

File System ID — When creating a new file system resource, you can leave this field blank. Leaving the field blank causes a file system ID to be assigned automatically after you click **Submit** at the **File System Resource Configuration** dialog box. If you need to assign a file system ID explicitly, specify it in this field.

Checkboxes — Specify mount and unmount actions when a service is stopped (for example, when disabling or relocating a service):

- **Force unmount** — If checked, forces the file system to unmount. The default setting is unchecked. **Force Unmount** kills all processes using the mount point to free up the mount when it tries to unmount.
- **Reboot host node if unmount fails** — If checked, reboots the node if unmounting this file system fails. The default setting is unchecked.
- **Check file system before mounting** — If checked, causes `fsck` to be run on the file system before mounting it. The default setting is unchecked.

IP Address

IP Address — Type the IP address for the resource.

Monitor Link checkbox — Check the box to enable or disable link status monitoring of the IP address resource

NFS Mount

Name — Create a symbolic name for the NFS mount.

Mount Point — Choose the path to which the file system resource is mounted.

Host — Specify the NFS server name.

Export Path — NFS export on the server.

NFS version — Specify NFS protocol:

- **NFS3** — Specifies using NFSv3 protocol. The default setting is **NFS**.
- **NFS4** — Specifies using NFSv4 protocol.

Options — Mount options. For more information, refer to the nfs(5) man page.

Force Unmount checkbox — If checked, forces the file system to unmount. The default setting is unchecked. **Force Unmount** kills all processes using the mount point to free up the mount when it tries to unmount.

NFS Client

Name — Enter a name for the NFS client resource.

Target — Enter a target for the NFS client resource. Supported targets are hostnames, IP addresses (with wild-card support), and netgroups.

Options — Additional client access rights. For more information, refer to the exports(5) man page, General Options

NFS Export

Name — Enter a name for the NFS export resource.

Script

Name — Enter a name for the custom user script.

File (with path) — Enter the path where this custom script is located (for example, `/etc/init.d/userscript`)

Samba Service

Name — Enter a name for the Samba server.

Workgroup — Enter the Windows workgroup name or Windows NT domain of the Samba service.

Note

When creating or editing a cluster service, connect a Samba-service resource directly to service, *not* to a resource within a service.

4. Click **Submit**. Clicking **Submit** causes a progress page to be displayed followed by the display of **Resources for*`cluster name`*** page. That page displays the added resource (and other resources).

9. Adding a Cluster Service to the Cluster

To add a cluster service to the cluster, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Services**. Clicking **Services** causes the display of services in the center of the page and causes the display of menu items for services configuration: **Add a Service** and **Configure a Service**.
2. Click **Add a Service**. Clicking **Add a Service** causes the **Add a Service** page to be displayed.
3. On the **Add a Service** page, at the **Service name** text box, type the name of the service. Below the **Service name** text box is an checkbox labeled **Automatically start this service**. The checkbox is checked by default. When the checkbox is checked, the service is started automatically when a cluster is started and running. If the checkbox is *not* checked, the

service must be started manually any time the cluster comes up from the stopped state.

Tip

Use a descriptive name that clearly distinguishes the service from other services in the cluster.

4. Add a resource to the service; click **Add a resource to this service**. Clicking **Add a resource to this service** causes the display of two drop-down boxes: **Add a new local resource** and **Use an existing global resource**. Adding a new local resource adds a resource that is available *only* to this service. The process of adding a local resource is the same as adding a global resource described in *Section 8, "Adding Cluster Resources"*. Adding a global resource adds a resource that has been previously added as a global resource (refer to *Section 8, "Adding Cluster Resources"*).

5. At the drop-down box of either **Add a new local resource** or **Use an existing global resource**, select the resource to add and configure it according to the options presented. (The options are the same as described in *Section 8, "Adding Cluster Resources"*.)

Note

If you are adding a Samba-service resource, connect a Samba-service resource directly to the service, *not* to a resource within a service.

6. If you want to add resources to that resource, click **Add a child**. Clicking **Add a child** causes the display of additional options to local and global resources. You can continue adding children resources to the resource to suit your requirements. To view children resources, click the triangle icon to the left of **Show Children**.

7. When you have completed adding resources to the service, and have completed adding children resources to resources, click **Submit**. Clicking **Submit** causes a progress page to be displayed followed by a page displaying the added service (and other services).

Note

To verify the existence of the IP service resource used in a cluster service, you must use the `/sbin/ip addr list` command on a cluster node. The following output shows the `/sbin/ip addr list` command executed on a node running a cluster service:

```
1: lo: <LOOPBACK,UP> mtu 16436 qdisc noqueue
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP> mtu 1356 qdisc pfifo_fast qlen 1000
    link/ether 00:05:5d:9a:d8:91 brd ff:ff:ff:ff:ff:ff
    inet 10.11.4.31/22 brd 10.11.7.255 scope global eth0
    inet6 fe80::205:5dff:fe9a:d891/64 scope link
    inet 10.11.4.240/22 scope global secondary eth0
       valid_lft forever preferred_lft forever
```

10. Configuring Cluster Storage

To configure storage for a cluster, click the **storage** tab. Clicking that tab causes the display of the **Welcome to Storage Configuration Interface** page.

The **storage** tab allows you to monitor and configure storage on remote systems. It provides a means for configuring disk partitions, logical volumes (clustered and single system use), file system parameters, and mount points. The **storage** tab provides an interface for setting up shared storage for clusters and offers GFS and other file systems as file system options. When a you select the **storage** tab, the **Welcome to Storage Configuration Interface** page shows a list of systems available to the you in a navigation table to the left. A small form allows you to choose a storage unit size to suit your preference. That choice is persisted and can be changed at any time by returning to this page. In addition, you can change the unit type on specific configuration forms throughout the storage user interface. This general choice allows you to avoid difficult decimal representations of storage size (for example, if you know that most of your storage is measured in gigabytes, terabytes, or other more familiar representations).

Additionally, the **Welcome to Storage Configuration Interface** page lists systems that you are authorized to access, but currently are unable to administer because of a problem. Examples of problems:

- A computer is unreachable via the network.
- A computer has been re-imaged and the **luci** server admin must re-authenticate with the **ricci** agent on the computer.

A reason for the trouble is displayed if the storage user interface can determine it.

Only those computers that the user is privileged to administer is shown in the main navigation table. If you have no permissions on any computers, a message is displayed.

After you select a computer to administer, a general properties page is displayed for the

computer. This page is divided into three sections:

- **Hard Drives**
- **Partitions**
- **Volume Groups**

Each section is set up as an expandable tree, with links to property sheets for specific devices, partitions, and storage entities.

Configure the storage for your cluster to suit your cluster requirements. If you are configuring Red Hat GFS, configure clustered logical volumes first, using CLVM. For more information about CLVM and GFS refer to Red Hat documentation for those products.

Note

Shared storage for use in Red Hat Cluster Suite requires that you be running the cluster logical volume manager daemon (`clvmd`) or the High Availability Logical Volume Management agents (HA-LVM). If you are not able to use either the `clvmd` daemon or HA-LVM for operational reasons or because you do not have the correct entitlements, you must not use single-instance LVM on the shared disk as this may result in data corruption. If you have any concerns please contact your Red Hat service representative.

Managing Red Hat Cluster With Conga

This chapter describes various administrative tasks for managing a Red Hat Cluster and consists of the following sections:

- *Section 1, “Starting, Stopping, and Deleting Clusters”*
- *Section 2, “Managing Cluster Nodes”*
- *Section 3, “Managing High-Availability Services”*
- *Section 4, “Diagnosing and Correcting Problems in a Cluster”*

1. Starting, Stopping, and Deleting Clusters

You can perform the following cluster-management functions through the **luci** server component of **Conga**:

- Restart a cluster.
- Start a cluster.
- Stop a cluster.
- Delete a cluster.

To perform one of the functions in the preceding list, follow the steps in this section. The starting point of the procedure is at the **cluster** tab (at the **Choose a cluster to administer** page).

1. At the right of the **Cluster Name** for each cluster listed on the **Choose a cluster to administer** page is a drop-down box. By default, the drop-down box is set to **Restart this cluster**. Clicking the drop-down box box reveals all the selections available: **Restart this cluster**, **Stop this cluster**/**Start this cluster**, and **Delete this cluster**. The actions of each function are summarized as follows:
   - **Restart this cluster** — Selecting this action causes the cluster to be restarted. You can select this action for any state the cluster is in.
   - **Stop this cluster**/**Start this cluster** — **Stop this cluster** is available when a cluster is running. **Start this cluster** is available when a cluster is stopped.

     Selecting **Stop this cluster** shuts down cluster software in all cluster nodes.

     Selecting **Start this cluster** starts cluster software.

- **Delete this cluster** — Selecting this action halts a running cluster, disables cluster software from starting automatically, and removes the cluster configuration file from each node. You can select this action for any state the cluster is in. Deleting a cluster frees each node in the cluster for use in another cluster.

2. Select one of the functions and click **Go**.

3. Clicking **Go** causes a progress page to be displayed. When the action is complete, a page is displayed showing either of the following pages according to the action selected:

   - For **Restart this cluster** and **Stop this cluster/Start this cluster** — Displays a page with the list of nodes for the cluster.

   - For **Delete this cluster** — Displays the **Choose a cluster to administer** page in the **cluster** tab, showing a list of clusters.

2. Managing Cluster Nodes

You can perform the following node-management functions through the **luci** server component of **Conga**:

- Make a node leave or join a cluster.
- Fence a node.
- Reboot a node.
- Delete a node.

To perform one the functions in the preceding list, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Nodes**. Clicking **Nodes** causes the display of nodes in the center of the page and causes the display of an **Add a Node** element and a **Configure** element with a list of the nodes already configured in the cluster.

2. At the right of each node listed on the page displayed from the preceding step, click the **Choose a task** drop-down box. Clicking **Choose a task** drop-down box reveals the following selections: **Have node leave cluster/Have node join cluster**, **Fence this node**, **Reboot this node**, and **Delete**. The actions of each function are summarized as follows:

   - **Have node leave cluster/Have node join cluster** — **Have node leave cluster** is available when a node has joined of a cluster. **Have node join cluster** is available when a node has left a cluster.

Selecting **Have node leave cluster** shuts down cluster software and makes the node leave the cluster. Making a node leave a cluster prevents the node from automatically joining the cluster when it is rebooted.

Selecting **Have node join cluster** starts cluster software and makes the node join the cluster. Making a node join a cluster allows the node to automatically join the cluster when it is rebooted.

- **Fence this node** — Selecting this action causes the node to be fenced according to how the node is configured to be fenced.
- **Reboot this node** — Selecting this action causes the node to be rebooted.
- **Delete** — Selecting this action causes the node to be deleted from the cluster configuration. It also stops all cluster services on the node, and deletes the `cluster.conf` file from `/etc/cluster/`.

3. Select one of the functions and click **Go**.
4. Clicking **Go** causes a progress page to be displayed. When the action is complete, a page is displayed showing the list of nodes for the cluster.

3. Managing High-Availability Services

You can perform the following management functions for high-availability services through the **luci** server component of **Conga**:

- Configure a service.
- Stop or start a service.
- Restart a service.
- Delete a service

To perform one the functions in the preceding list, follow the steps in this section. The starting point of the procedure is at the cluster-specific page that you navigate to from **Choose a cluster to administer** displayed on the **cluster** tab.

1. At the detailed menu for the cluster (below the **clusters** menu), click **Services**. Clicking **Services** causes the display of services for the cluster in the center of the page.
2. At the right of each service listed on the page, click the **Choose a task** drop-down box. Clicking **Choose a task** drop-down box reveals the following selections depending on if the service is running:

- If service is running — **Configure this service**, **Restart this service**, and **Stop this service**.
- If service is not running — **Configure this service**, **Start this service**, and **Delete this service**.

The actions of each function are summarized as follows:

- **Configure this service** — **Configure this service** is available when the service is running or not running. Selecting **Configure this service** causes the services configuration page for the service to be displayed. On that page, you can change the configuration of the service. For example, you can add a resource to the service. (For more information about adding resources and services, refer to*Section 8, "Adding Cluster Resources"* and *Section 9, "Adding a Cluster Service to the Cluster"*.) In addition, a drop-down box on the page provides other functions depending on if the service is running.

  When a service is running, the drop-down box provides the following functions: restarting, disabling, and relocating the service.

  When a service is not running, the drop-down box on the configuration page provides the following functions: enabling and deleting the service.

  If you are making configuration changes, save the changes by clicking **Save**. Clicking **Save** causes a progress page to be displayed. When the change is complete, another page is displayed showing a list of services for the cluster.

  If you have selected one of the functions in the drop-down box on the configuration page, click **Go**. Clicking **Go** causes a progress page to be displayed. When the change is complete, another page is displayed showing a list of services for the cluster.

- **Restart this service** and **Stop this service** — These selections are available when the service is running. Select either function and click **Go** to make the change take effect. Clicking **Go** causes a progress page to be displayed. When the change is complete, another page is displayed showing a list of services for the cluster.
- **Start this service** and **Delete this service** — These selections are available when the service is not running. Select either function and click **Go** to make the change take effect. Clicking **Go** causes a progress page to be displayed. When the change is complete, another page is displayed showing a list of services for the cluster.

4. Diagnosing and Correcting Problems in a Cluster

For information about diagnosing and correcting problems in a cluster, contact an authorized Red Hat support representative.

Configuring Red Hat Cluster With system-config-cluster

This chapter describes how to configure Red Hat Cluster software using `system-config-cluster`, and consists of the following sections:

- *Section 1, "Configuration Tasks"*
- *Section 2, "Starting the **Cluster Configuration Tool**"*
- *Section 3, "Configuring Cluster Properties"*
- *Section 4, "Configuring Fence Devices"*
- *Section 5, "Adding and Deleting Members"*
- *Section 6, "Configuring a Failover Domain"*
- *Section 7, "Adding Cluster Resources"*
- *Section 8, "Adding a Cluster Service to the Cluster"*
- *Section 9, "Propagating The Configuration File: New Cluster"*
- *Section 10, "Starting the Cluster Software"*

Tip

While `system-config-cluster` provides several convenient tools for configuring and managing a Red Hat Cluster, the newer, more comprehensive tool, **Conga**, provides more convenience and flexibility than `system-config-cluster`. You may want to consider using **Conga** instead (refer to *Chapter 3, Configuring Red Hat Cluster With **Conga*** and *Chapter 4, Managing Red Hat Cluster With **Conga***).

1. Configuration Tasks

Configuring Red Hat Cluster software with `system-config-cluster` consists of the following steps:

1. Starting the **Cluster Configuration Tool**, `system-config-cluster`. Refer to *Section 2, "Starting the **Cluster Configuration Tool**"*.
2. Configuring cluster properties. Refer to *Section 3, "Configuring Cluster Properties"*.

3. Creating fence devices. Refer to *Section 4, "Configuring Fence Devices"*.
4. Creating cluster members. Refer to *Section 5, "Adding and Deleting Members"*.
5. Creating failover domains. Refer to *Section 6, "Configuring a Failover Domain"*.
6. Creating resources. Refer to *Section 7, "Adding Cluster Resources"*.
7. Creating cluster services.

   Refer to *Section 8, "Adding a Cluster Service to the Cluster"*.
8. Propagating the configuration file to the other nodes in the cluster.

   Refer to *Section 9, "Propagating The Configuration File: New Cluster"*.
9. Starting the cluster software. Refer to *Section 10, "Starting the Cluster Software"*.

2. Starting the Cluster Configuration Tool

You can start the **Cluster Configuration Tool** by logging in to a cluster node as root with the `ssh -Y` command and issuing the `system-config-cluster` command. For example, to start the **Cluster Configuration Tool** on cluster node nano-01, do the following:

1. Log in to a cluster node and run `system-config-cluster`. For example:

```
$  ssh -Y root@nano-01
  .
  .
  .
# system-config-cluster
```

2. If this is the first time you have started the **Cluster Configuration Tool**, the program prompts you to either open an existing configuration or create a new one. Click **Create New Configuration** to start a new configuration file (refer to *Figure 5.1, "Starting a New Configuration File"*).

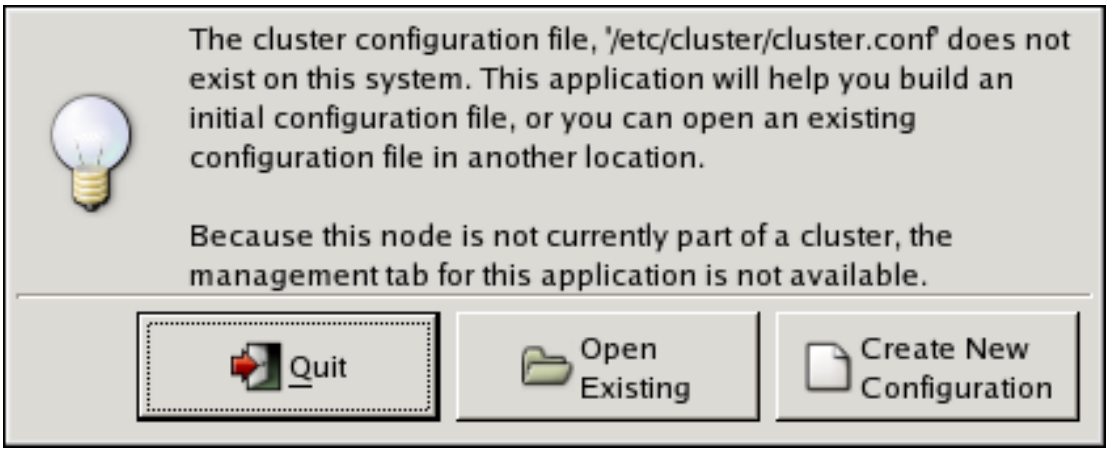

Figure 5.1. Starting a New Configuration File

Note

The **Cluster Management** tab for the Red Hat Cluster Suite management GUI is available after you save the configuration file with the **Cluster Configuration Tool**, exit, and restart the the Red Hat Cluster Suite management GUI (`system-config-cluster`). (The **Cluster Management** tab displays the status of the cluster service manager, cluster nodes, and resources, and shows statistics concerning cluster service operation. To manage the cluster system further, choose the **Cluster Configuration** tab.)

3. Clicking **Create New Configuration** causes the **New Configuration** dialog box to be displayed (refer to *Figure 5.2, "Creating A New Configuration"*). The **New Configuration** dialog box provides a text box for a cluster name and group boxes for the following configuration options: **Choose Lock Method**, **Use Multicast** (DLM clusters only), and **Use a Quorum Disk** (DLM clusters only). In most circumstances you only need to configure a cluster name and a lock method. **Distributed Lock Manager (DLM)** is the default lock method. To configure a GULM cluster, select **Grand Unified Lock Manager (GULM)**. (Selecting **Grand Unified Lock Manager (GULM)** disables **Use Multicast** and **Use a Quorum Disk**, which are applicable only to DLM clusters). **Use Multicast** specifies whether a multicast address is used for cluster management communication among cluster nodes. **Use Multicast** is disabled (checkbox unchecked) by default. To use a multicast address for cluster management communication among cluster nodes, click the **Use Multicast** checkbox (enabled when checked). When **Use Multicast** is enabled, the **Address** text boxes are enabled; enter the multicast address into the **Address** text boxes. To use a quorum disk, click the **Use a Quorum Disk** checkbox and enter quorum disk parameters. The following quorum-disk parameters are available in the dialog box if you enable **Use a Quorum Disk**: **Interval**, **TKO**, **Votes**, **Minimum Score**, **Device**, **Label**, and **Quorum Disk Heuristic**.

Table 5.1, "Quorum-Disk Parameters" describes the parameters.

Important

Quorum-disk parameters and heuristics depend on the site environment and special requirements needed. To understand the use of quorum-disk parameters and heuristics, refer to the qdisk(5) man page. If you require assistance understanding and using quorum disk, contact an authorized Red Hat support representative.

Tip

It is probable that configuring a quorum disk requires changing quorum-disk parameters after the initial configuration. The **Cluster Configuration Tool** (`system-config-cluster`) provides only the display of quorum-disk parameters after initial configuration. If you need to configure quorum disk, consider using **Conga** instead; **Conga** allows modification of quorum disk parameters.

Overall:

While `system-config-cluster` provides several convenient tools for configuring and managing a Red Hat Cluster, the newer, more comprehensive tool, **Conga**, provides more convenience and flexibility than `system-config-cluster`. You may want to consider using **Conga** instead (refer to *Chapter 3, Configuring Red Hat Cluster With **Conga*** and *Chapter 4, Managing Red Hat Cluster With **Conga***).

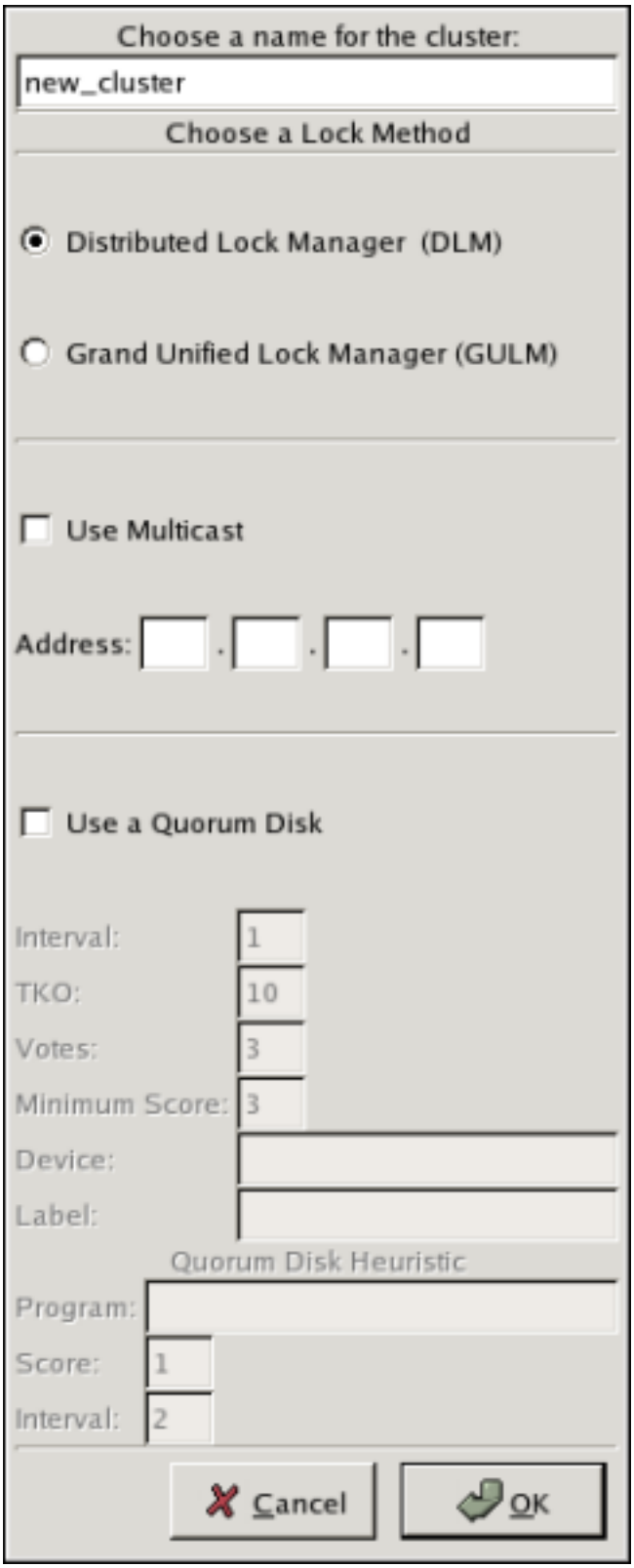

Figure 5.2. Creating A New Configuration

4. When you have completed entering the cluster name and other parameters in the **New Configuration** dialog box, click **OK**. Clicking **OK** starts the **Cluster Configuration Tool**, displaying a graphical representation of the configuration (*Figure 5.3, "The **Cluster Configuration Tool**"*).

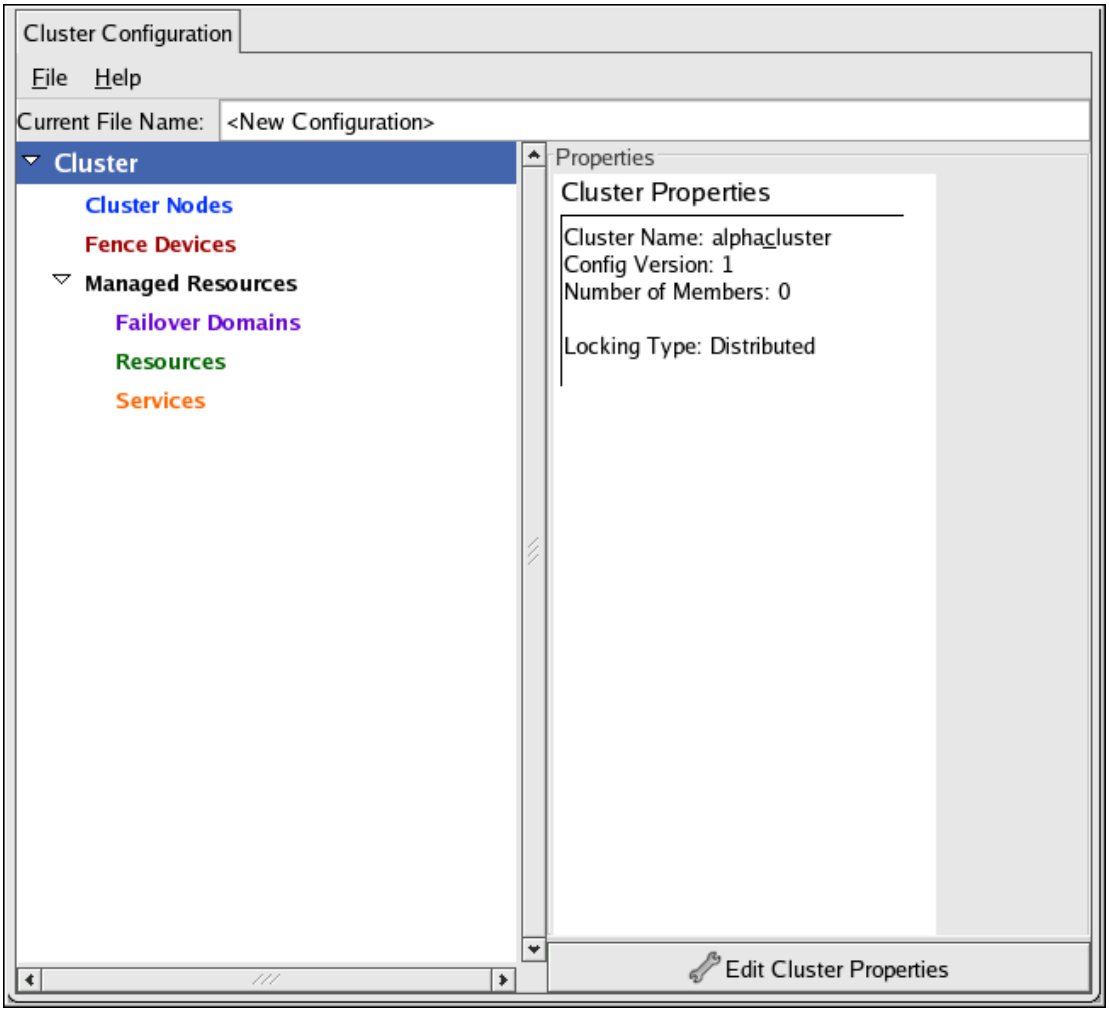

Figure 5.3. The Cluster Configuration Tool

Parameter	Description
Use a Quorum Disk	Enables quorum disk. Enables quorum-disk parameters in the **New Configuration** dialog box.
Interval	The frequency of read/write cycles, in seconds.
TKO	The number of cycles a node must miss in order to be declared dead.
Votes	The number of votes the quorum daemon advertises to CMAN when it has a high enough score.
Minimum Score	The minimum score for a node to be considered "alive". If omitted or

Parameter	Description
	set to 0, the default function, `floor((n+1)/2)`, is used, where *n* is the sum of the heuristics scores. The **Minimum Score** value must never exceed the sum of the heuristic scores; otherwise, the quorum disk cannot be available.
Device	The storage device the quorum daemon uses. The device must be the same on all nodes.
Label	Specifies the quorum disk label created by the `mkqdisk` utility. If this field contains an entry, the label overrides the **Device** field. If this field is used, the quorum daemon reads `/proc/partitions` and checks for qdisk signatures on every block device found, comparing the label against the specified label. This is useful in configurations where the quorum device name differs among nodes.
Quorum Disk Heuristics	**Program** — The program used to determine if this heuristic is alive. This can be anything that can be executed by `/bin/sh -c`. A return value of 0 indicates success; anything else indicates failure. This field is required. **Score** — The weight of this heuristic. Be careful when determining scores for heuristics. The default score for each heuristic is 1. **Interval** — The frequency (in seconds) at which the heuristic is polled. The default interval for every heuristic is 2 seconds.

Table 5.1. Quorum-Disk Parameters

3. Configuring Cluster Properties

In addition to configuring cluster parameters in the preceding section (*Section 2, "Starting the **Cluster Configuration Tool**"*), you can configure the following cluster properties: **Cluster Alias** (optional), a **Config Version** (optional), and **Fence Daemon Properties**. To configure cluster properties, follow these steps:

1. At the left frame, click **Cluster**.
2. At the bottom of the right frame (labeled **Properties**), click the **Edit Cluster Properties** button. Clicking that button causes a **Cluster Properties** dialog box to be displayed. The **Cluster Properties** dialog box presents text boxes for **Cluster Alias**, and **Config Version**, and two **Fence Daemon Properties** parameters (DLM clusters only): **Post-Join Delay** and **Post-Fail Delay**.
3. (Optional) At the **Cluster Alias** text box, specify a cluster alias for the cluster. The default cluster alias is set to the true cluster name provided when the cluster is set up (refer to *Section 2, "Starting the **Cluster Configuration Tool**"*). The cluster alias should be descriptive enough to distinguish it from other clusters and systems on your network (for example,

nfs_cluster or **httpd_cluster**). The cluster alias cannot exceed 15 characters.

4. (Optional) The **Config Version** value is set to **1** by default and is automatically incremented each time you save your cluster configuration. However, if you need to set it to another value, you can specify it at the **Config Version** text box.

5. Specify the **Fence Daemon Properties** parameters (DLM clusters only): **Post-Join Delay** and **Post-Fail Delay**.

   a. The **Post-Join Delay** parameter is the number of seconds the fence daemon (fenced) waits before fencing a node after the node joins the fence domain. The **Post-Join Delay** default value is **3**. A typical setting for **Post-Join Delay** is between 20 and 30 seconds, but can vary according to cluster and network performance.

   b. The **Post-Fail Delay** parameter is the number of seconds the fence daemon (fenced) waits before fencing a node (a member of the fence domain) after the node has failed.The **Post-Fail Delay** default value is **0**. Its value may be varied to suit cluster and network performance.

Note

For more information about **Post-Join Delay** and **Post-Fail Delay**, refer to the fenced(8) man page.

6. Save cluster configuration changes by selecting **File** => **Save**.

4. Configuring Fence Devices

Configuring fence devices for the cluster consists of selecting one or more fence devices and specifying fence-device-dependent parameters (for example, name, IP address, login, and password).

To configure fence devices, follow these steps:

1. Click **Fence Devices**. At the bottom of the right frame (labeled **Properties**), click the **Add a Fence Device** button. Clicking **Add a Fence Device** causes the **Fence Device Configuration** dialog box to be displayed (refer to *Figure 5.4, "Fence Device Configuration"*).

Figure 5.4. Fence Device Configuration

2. At the **Fence Device Configuration** dialog box, click the drop-down box under **Add a New Fence Device** and select the type of fence device to configure.
3. Specify the information in the **Fence Device Configuration** dialog box according to the type of fence device. Refer to *Appendix B, Fence Device Parameters* for more information about fence device parameters.
4. Click **OK**.
5. Choose **File** => **Save** to save the changes to the cluster configuration.

5. Adding and Deleting Members

The procedures to add or delete a cluster member vary depending on whether the cluster is a newly configured cluster or a cluster that is already configured and running.

To add a member to a new cluster, refer to *Section 5.1, "Adding a Member to a New Cluster"*.

To add or delete a cluster member in an existing cluster, refer to the following sections:

- *Section 5.2, "Adding a Member to a Running DLM Cluster"*
- *Section 5.3, "Deleting a Member from a DLM Cluster"*
- *Section 5.4, "Adding a GULM Client-only Member"*

- *Section 5.5, "Deleting a GULM Client-only Member"*
- *Section 5.6, "Adding or Deleting a GULM Lock Server Member"*

5.1. Adding a Member to a New Cluster

To add a member to a new cluster, follow these steps:

1. At system-config-cluster, in the **Cluster Configuration Tool** tab, click **Cluster Node**.
2. At the bottom of the right frame (labeled **Properties**), click the **Add a Cluster Node** button. Clicking that button causes a **Node Properties** dialog box to be displayed. For a DLM cluster, the **Node Properties** dialog box presents text boxes for **Cluster Node Name** and **Quorum Votes** (refer to *Figure 5.5, "Adding a Member to a New DLM Cluster"*). For a GULM cluster, the **Node Properties** dialog box presents text boxes for **Cluster Node Name** and **Quorum Votes**, and presents a checkbox for **GULM Lockserver** (refer to *Figure 5.6, "Adding a Member to a New GULM Cluster"*)

Important

The number of nodes that can be configured as GULM lock servers is limited to either one, three, or five.

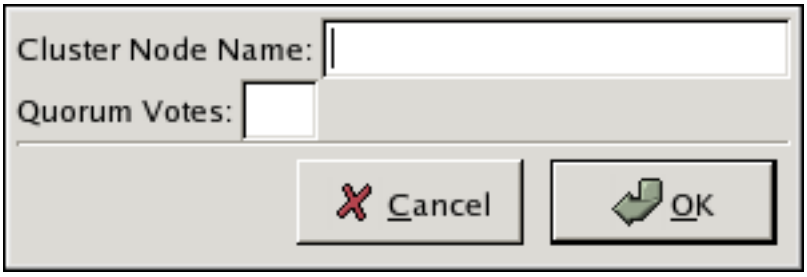

Figure 5.5. Adding a Member to a New DLM Cluster

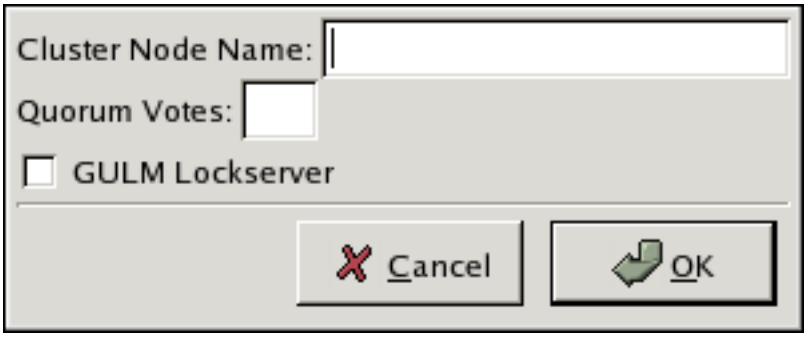

Figure 5.6. Adding a Member to a New GULM Cluster

3. At the **Cluster Node Name** text box, specify a node name. The entry can be a name or an IP address of the node on the cluster subnet.

Note

Each node must be on the same subnet as the node from which you are running the **Cluster Configuration Tool** and must be defined either in DNS or in the `/etc/hosts` file of each cluster node.

Note

The node on which you are running the **Cluster Configuration Tool** must be explicitly added as a cluster member; the node is not automatically added to the cluster configuration as a result of running the **Cluster Configuration Tool**.

4. Optionally, at the **Quorum Votes** text box, you can specify a value; however in most configurations you can leave it blank. Leaving the **Quorum Votes** text box blank causes the quorum votes value for that node to be set to the default value of **1**.
5. Click **OK**.
6. Configure fencing for the node:
   a. Click the node that you added in the previous step.
   b. At the bottom of the right frame (below **Properties**), click **Manage Fencing For This Node**. Clicking **Manage Fencing For This Node** causes the **Fence Configuration** dialog box to be displayed.
   c. At the **Fence Configuration** dialog box, bottom of the right frame (below **Properties**), click **Add a New Fence Level**. Clicking **Add a New Fence Level** causes a fence-level element (for example, **Fence-Level-1**, **Fence-Level-2**, and so on) to be displayed below the node in the left frame of the **Fence Configuration** dialog box.
   d. Click the fence-level element.
   e. At the bottom of the right frame (below **Properties**), click **Add a New Fence to this Level**. Clicking **Add a New Fence to this Level** causes the **Fence Properties** dialog box to be displayed.
   f. At the **Fence Properties** dialog box, click the **Fence Device Type** drop-down box and

select the fence device for this node. Also, provide additional information required (for example, **Port** and **Switch** for an APC Power Device).

g. At the **Fence Properties** dialog box, click **OK**. Clicking **OK** causes a fence device element to be displayed below the fence-level element.

h. To create additional fence devices at this fence level, return to step 6d. Otherwise, proceed to the next step.

i. To create additional fence levels, return to step 6c. Otherwise, proceed to the next step.

j. If you have configured all the fence levels and fence devices for this node, click **Close**.

7. Choose **File** => **Save** to save the changes to the cluster configuration.

To continue configuring a new cluster, proceed to *Section 6, "Configuring a Failover Domain"*.

5.2. Adding a Member to a Running DLM Cluster

The procedure for adding a member to a running DLM cluster depends on whether the cluster contains only two nodes or more than two nodes. To add a member to a running DLM cluster, follow the steps in one of the following sections according to the number of nodes in the cluster:

- For clusters with *only* two nodes —

  Section 5.2.1, "Adding a Member to a Running DLM Cluster That Contains Only Two Nodes"

- For clusters with *more than* two nodes —

  Section 5.2.2, "Adding a Member to a Running DLM Cluster That Contains More Than Two Nodes"

5.2.1. Adding a Member to a Running DLM Cluster That Contains *Only* Two Nodes

To add a member to an existing DLM cluster that is currently in operation, and contains *only* two nodes, follow these steps:

1. Add the node and configure fencing for it as in *Section 5.1, "Adding a Member to a New Cluster"*.

2. Click **Send to Cluster** to propagate the updated configuration to other running nodes in the cluster.

3. Use the `scp` command to send the updated `/etc/cluster/cluster.conf` file from one of the existing cluster nodes to the new node.

4. At `system-config-cluster`, in the **Cluster Status Tool** tab, disable each service listed under **Services**.
5. Stop the cluster software on the two running nodes by running the following commands at each node in this order:
   a. `service rgmanager stop`, if the cluster is running high-availability services (`rgmanager`)
   b. `service gfs stop`, if you are using Red Hat GFS
   c. `service clvmd stop`, if CLVM has been used to create clustered volumes
   d. `service fenced stop`
   e. `service cman stop`
   f. `service ccsd stop`
6. Start cluster software on all cluster nodes (including the added one) by running the following commands in this order:
   a. `service ccsd start`
   b. `service cman start`
   c. `service fenced start`
   d. `service clvmd start`, if CLVM has been used to create clustered volumes
   e. `service gfs start`, if you are using Red Hat GFS
   f. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)
7. Start `system-config-cluster` (refer to *Section 2, "Starting the **Cluster Configuration Tool**"*). At the **Cluster Configuration Tool** tab, verify that the configuration is correct. At the **Cluster Status Tool** tab verify that the nodes and services are running as expected.

Note

Make sure to configure other parameters that may be affected by changes in this section. Refer to *Section 1, "Configuration Tasks"*.

5.2.2. Adding a Member to a Running DLM Cluster That Contains *More Than* Two Nodes

To add a member to an existing DLM cluster that is currently in operation, and contains *more than* two nodes, follow these steps:

1. Add the node and configure fencing for it as in *Section 5.1, "Adding a Member to a New Cluster"*.
2. Click **Send to Cluster** to propagate the updated configuration to other running nodes in the cluster.
3. Use the `scp` command to send the updated `/etc/cluster/cluster.conf` file from one of the existing cluster nodes to the new node.
4. Start cluster services on the new node by running the following commands in this order:
   a. `service ccsd start`
   b. `service cman start`
   c. `service fenced start`
   d. `service clvmd start`, if CLVM has been used to create clustered volumes
   e. `service gfs start`, if you are using Red Hat GFS
   f. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)
5. Start `system-config-cluster` (refer to *Section 2, "Starting the **Cluster Configuration Tool**"*). At the **Cluster Configuration Tool** tab, verify that the configuration is correct. At the **Cluster Status Tool** tab verify that the nodes and services are running as expected.

Note

Make sure to configure other parameters that may be affected by changes in this section. Refer to *Section 1, "Configuration Tasks"*.

5.3. Deleting a Member from a DLM Cluster

To delete a member from an existing DLM cluster that is currently in operation, follow these steps:

1. At one of the running nodes (not at a node to be deleted), start `system-config-cluster` (refer to *Section 2, "Starting the **Cluster Configuration Tool**"*). At the **Cluster Status Tool** tab, under **Services**, disable or relocate each service that is running on the node to be deleted.
2. Stop the cluster software on the node to be deleted by running the following commands at that node in this order:
   a. `service rgmanager stop`, if the cluster is running high-availability services (`rgmanager`)

b. `service gfs stop`, if you are using Red Hat GFS

c. `service clvmd stop`, if CLVM has been used to create clustered volumes

d. `service fenced stop`

e. `service cman stop`

f. `service ccsd stop`

3. At `system-config-cluster` (running on a node that is not to be deleted), in the **Cluster Configuration Tool** tab, delete the member as follows:

   a. If necessary, click the triangle icon to expand the **Cluster Nodes** property.

   b. Select the cluster node to be deleted. At the bottom of the right frame (labeled **Properties**), click the **Delete Node** button.

   c. Clicking the **Delete Node** button causes a warning dialog box to be displayed requesting confirmation of the deletion (*Figure 5.7, "Confirm Deleting a Member"*).

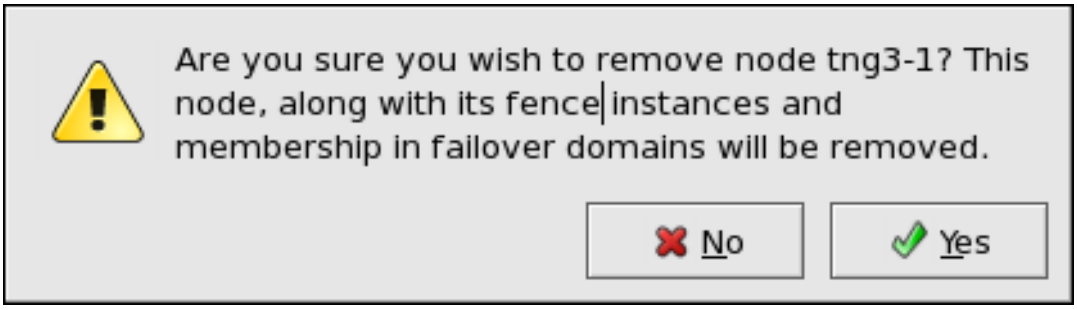

Figure 5.7. Confirm Deleting a Member

   d. At that dialog box, click **Yes** to confirm deletion.

   e. Propagate the updated configuration by clicking the **Send to Cluster** button. (Propagating the updated configuration automatically saves the configuration.)

4. Stop the cluster software on the remaining running nodes by running the following commands at each node in this order:

   a. `service rgmanager stop`, if the cluster is running high-availability services (`rgmanager`)

   b. `service gfs stop`, if you are using Red Hat GFS

   c. `service clvmd stop`, if CLVM has been used to create clustered volumes

   d. `service fenced stop`

   e. `service cman stop`

f. `service ccsd stop`

5. Start cluster software on all remaining cluster nodes by running the following commands in this order:

   a. `service ccsd start`

   b. `service cman start`

   c. `service fenced start`

   d. `service clvmd start`, if CLVM has been used to create clustered volumes

   e. `service gfs start`, if you are using Red Hat GFS

   f. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)

6. At `system-config-cluster` (running on a node that was not deleted), in the **Cluster Configuration Tool** tab, verify that the configuration is correct. At the **Cluster Status Tool** tab verify that the nodes and services are running as expected.

Note

Make sure to configure other parameters that may be affected by changes in this section. Refer to *Section 1, "Configuration Tasks"*.

5.4. Adding a GULM Client-only Member

The procedure for adding a member to a running GULM cluster depends on the type of GULM node: either a node that functions only as a GULM client (a cluster member capable of running applications, but not eligible to function as a GULM lock server) or a node that functions as a GULM lock server. This procedure describes how to add a member that functions only as a GULM client. To add a member that functions as a GULM lock server, refer to *Section 5.6, "Adding or Deleting a GULM Lock Server Member"*.

To add a member that functions only as a GULM client to an existing cluster that is currently in operation, follow these steps:

1. At one of the running members, start `system-config-cluster` (refer to *Section 2, "Starting the **Cluster Configuration Tool**"*). At the **Cluster Configuration Tool** tab, add the node and configure fencing for it as in *Section 5.1, "Adding a Member to a New Cluster"*.

2. Click **Send to Cluster** to propagate the updated configuration to other running nodes in the cluster.

3. Use the `scp` command to send the updated `/etc/cluster/cluster.conf` file from one of the existing cluster nodes to the new node.

4. Start cluster services on the new node by running the following commands in this order:

   a. `service ccsd start`

   b. `service lock_gulmd start`

   c. `service clvmd start`, if CLVM has been used to create clustered volumes

   d. `service gfs start`, if you are using Red Hat GFS

   e. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)

5. At `system-config-cluster`, in the **Cluster Configuration Tool** tab, verify that the configuration is correct. At the **Cluster Status Tool** tab verify that the nodes and services are running as expected.

Note

Make sure to configure other parameters that may be affected by changes in this section. Refer to *Section 1, "Configuration Tasks"*.

5.5. Deleting a GULM Client-only Member

The procedure for deleting a member from a running GULM cluster depends on the type of member to be removed: either a node that functions only as a GULM client (a cluster member capable of running applications, but not eligible to function as a GULM lock server) or a node that functions as a GULM lock server. The procedure in this section describes how to delete a member that functions only as a GULM client. To remove a member that functions as a GULM lock server, refer to *Section 5.6, "Adding or Deleting a GULM Lock Server Member"*.

To delete a member functioning only as a GULM client from an existing cluster that is currently in operation, follow these steps:

1. At one of the running nodes (not at a node to be deleted), start `system-config-cluster` (refer to *Section 2, "Starting the **Cluster Configuration Tool**"*). At the **Cluster Status Tool** tab, under **Services**, disable or relocate each service that is running on the node to be deleted.

2. Stop the cluster software on the node to be deleted by running the following commands at that node in this order:

   a. `service rgmanager stop`, if the cluster is running high-availability services (`rgmanager`)

b. `service gfs stop`, if you are using Red Hat GFS

c. `service clvmd stop`, if CLVM has been used to create clustered volumes

d. `service lock_gulmd stop`

e. `service ccsd stop`

3. At `system-config-cluster` (running on a node that is not to be deleted), in the **Cluster Configuration Tool** tab, delete the member as follows:

   a. If necessary, click the triangle icon to expand the **Cluster Nodes** property.

   b. Select the cluster node to be deleted. At the bottom of the right frame (labeled **Properties**), click the **Delete Node** button.

   c. Clicking the **Delete Node** button causes a warning dialog box to be displayed requesting confirmation of the deletion (*Figure 5.8, "Confirm Deleting a Member"*).

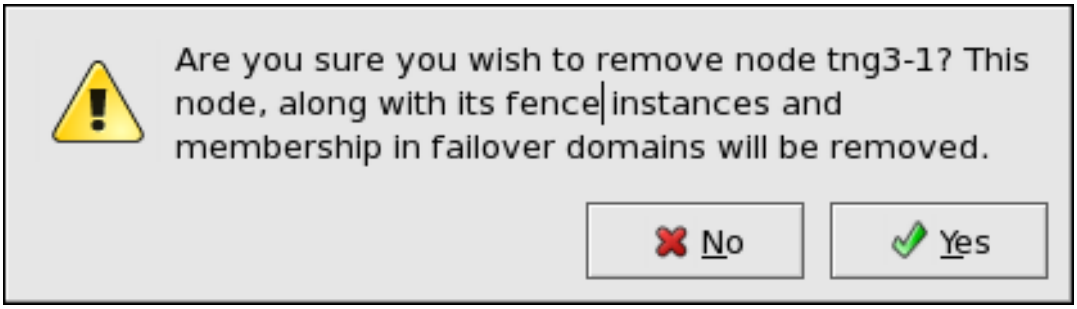

Figure 5.8. Confirm Deleting a Member

   d. At that dialog box, click **Yes** to confirm deletion.

   e. Propagate the updated configuration by clicking the **Send to Cluster** button. (Propagating the updated configuration automatically saves the configuration.)

4. Stop the cluster software on the remaining running nodes by running the following commands at each node in this order:

   a. `service rgmanager stop`, if the cluster is running high-availability services (`rgmanager`)

   b. `service gfs stop`, if you are using Red Hat GFS

   c. `service clvmd stop`, if CLVM has been used to create clustered volumes

   d. `service lock_gulmd stop`

   e. `service ccsd stop`

5. Start cluster software on all remaining cluster nodes by running the following commands in

this order:

a. `service ccsd start`

b. `service lock_gulmd start`

c. `service clvmd start`, if CLVM has been used to create clustered volumes

d. `service gfs start`, if you are using Red Hat GFS

e. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)

6. At `system-config-cluster` (running on a node that was not deleted), in the **Cluster Configuration Tool** tab, verify that the configuration is correct. At the **Cluster Status Tool** tab verify that the nodes and services are running as expected.

Note

Make sure to configure other parameters that may be affected by changes in this section. Refer to *Section 1, "Configuration Tasks"*.

5.6. Adding or Deleting a GULM Lock Server Member

The procedure for adding or deleting a GULM cluster member depends on the type of GULM node: either a node that functions only as a GULM client (a cluster member capable of running applications, but not eligible to function as a GULM lock server) or a node that functions as a GULM lock server. The procedure in this section describes how to add or delete a member that functions as a GULM lock server. To add a member that functions only as a GULM client, refer to *Section 5.4, "Adding a GULM Client-only Member"*; to delete a member that functions only as a GULM client, refer to *Section 5.5, "Deleting a GULM Client-only Member"*.

Important

The number of nodes that can be configured as GULM lock servers is limited to either one, three, or five.

To add or delete a GULM member that functions as a GULM lock server in an existing cluster that is currently in operation, follow these steps:

1. At one of the running members (running on a node that is not to be deleted), start `system-config-cluster` (refer to *Section 2, "Starting the **Cluster Configuration Tool**"*). At the **Cluster Status Tool** tab, disable each service listed under **Services**.

2. Stop the cluster software on each running node by running the following commands at each node in this order:

   a. `service rgmanager stop`, if the cluster is running high-availability services (`rgmanager`)

   b. `service gfs stop`, if you are using Red Hat GFS

   c. `service clvmd stop`, if CLVM has been used to create clustered volumes

   d. `service lock_gulmd stop`

   e. `service ccsd stop`

3. To add a a GULM lock server member, at `system-config-cluster`, in the **Cluster Configuration Tool** tab, add each node and configure fencing for it as in *Section 5.1, "Adding a Member to a New Cluster"*. Make sure to select **GULM Lockserver** in the **Node Properties** dialog box (refer to *Figure 5.6, "Adding a Member to a New GULM Cluster"*).

4. To delete a GULM lock server member, at `system-config-cluster` (running on a node that is not to be deleted), in the **Cluster Configuration Tool** tab, delete each member as follows:

   a. If necessary, click the triangle icon to expand the **Cluster Nodes** property.

   b. Select the cluster node to be deleted. At the bottom of the right frame (labeled **Properties**), click the **Delete Node** button.

   c. Clicking the **Delete Node** button causes a warning dialog box to be displayed requesting confirmation of the deletion (*Figure 5.9, "Confirm Deleting a Member"*).

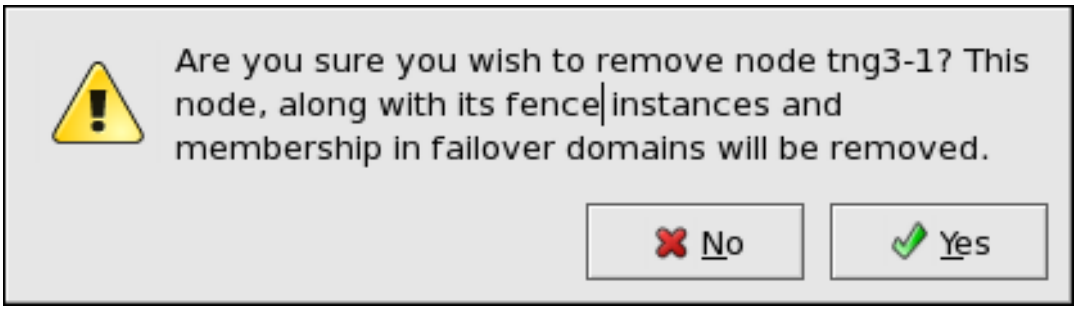

Figure 5.9. Confirm Deleting a Member

   d. At that dialog box, click **Yes** to confirm deletion.

5. Propagate the configuration file to the cluster nodes as follows:

   a. Log in to the node where you created the configuration file (the same node used for running `system-config-cluster`).

   b. Using the `scp` command, copy the `/etc/cluster/cluster.conf` file to all nodes in the cluster.

Note

Propagating the cluster configuration file this way is necessary under these circumstances because the cluster software is not running, and therefore not capable of propagating the configuration. Once a cluster is installed and running, the cluster configuration file is propagated using the Red Hat cluster management GUI **Send to Cluster** button. For more information about propagating the cluster configuration using the GUI **Send to Cluster** button, refer to *Section 3, "Modifying the Cluster Configuration"*.

c. After you have propagated the cluster configuration to the cluster nodes you can either reboot each node or start the cluster software on each cluster node by running the following commands at each node in this order:

   i. `service ccsd start`

   ii. `service lock_gulmd start`

   iii. `service clvmd start`, if CLVM has been used to create clustered volumes

   iv. `service gfs start`, if you are using Red Hat GFS

   v. `service rgmanager start`, if the node is also functioning as a GULM client and the cluster is running cluster services (`rgmanager`)

d. At `system-config-cluster` (running on a node that was not deleted), in the **Cluster Configuration Tool** tab, verify that the configuration is correct. At the **Cluster Status Tool** tab verify that the nodes and services are running as expected.

Note

Make sure to configure other parameters that may be affected by changes in this section. Refer to *Section 1, "Configuration Tasks"*.

6. Configuring a Failover Domain

A failover domain is a named subset of cluster nodes that are eligible to run a cluster service in the event of a node failure. A failover domain can have the following characteristics:

- Unrestricted — Allows you to specify that a subset of members are preferred, but that a cluster service assigned to this domain can run on any available member.

- Restricted — Allows you to restrict the members that can run a particular cluster service. If none of the members in a restricted failover domain are available, the cluster service cannot be started (either manually or by the cluster software).
- Unordered — When a cluster service is assigned to an unordered failover domain, the member on which the cluster service runs is chosen from the available failover domain members with no priority ordering.
- Ordered — Allows you to specify a preference order among the members of a failover domain. The member at the top of the list is the most preferred, followed by the second member in the list, and so on.

Note

Changing a failover domain configuration has no effect on currently running services.

Note

Failover domains are *not* required for operation.

By default, failover domains are unrestricted and unordered.

In a cluster with several members, using a restricted failover domain can minimize the work to set up the cluster to run a cluster service (such as `httpd`), which requires you to set up the configuration identically on all members that run the cluster service). Instead of setting up the entire cluster to run the cluster service, you must set up only the members in the restricted failover domain that you associate with the cluster service.

Tip

To configure a preferred member, you can create an unrestricted failover domain comprising only one cluster member. Doing that causes a cluster service to run on that cluster member primarily (the preferred member), but allows the cluster service to fail over to any of the other members.

The following sections describe adding a failover domain, removing a failover domain, and removing members from a failover domain:

- *Section 6.1, “Adding a Failover Domain”*

- *Section 6.2, “Removing a Failover Domain”*
- *Section 6.3, “Removing a Member from a Failover Domain”*

6.1. Adding a Failover Domain

To add a failover domain, follow these steps:

1. At the left frame of the the **Cluster Configuration Tool**, click **Failover Domains**.
2. At the bottom of the right frame (labeled **Properties**), click the **Create a Failover Domain** button. Clicking the **Create a Failover Domain** button causes the **Add Failover Domain** dialog box to be displayed.
3. At the **Add Failover Domain** dialog box, specify a failover domain name at the **Name for new Failover Domain** text box and click **OK**. Clicking **OK** causes the **Failover Domain Configuration** dialog box to be displayed (*Figure 5.10, “**Failover Domain Configuration**: Configuring a Failover Domain”*).

Note

The name should be descriptive enough to distinguish its purpose relative to other names used in your cluster.

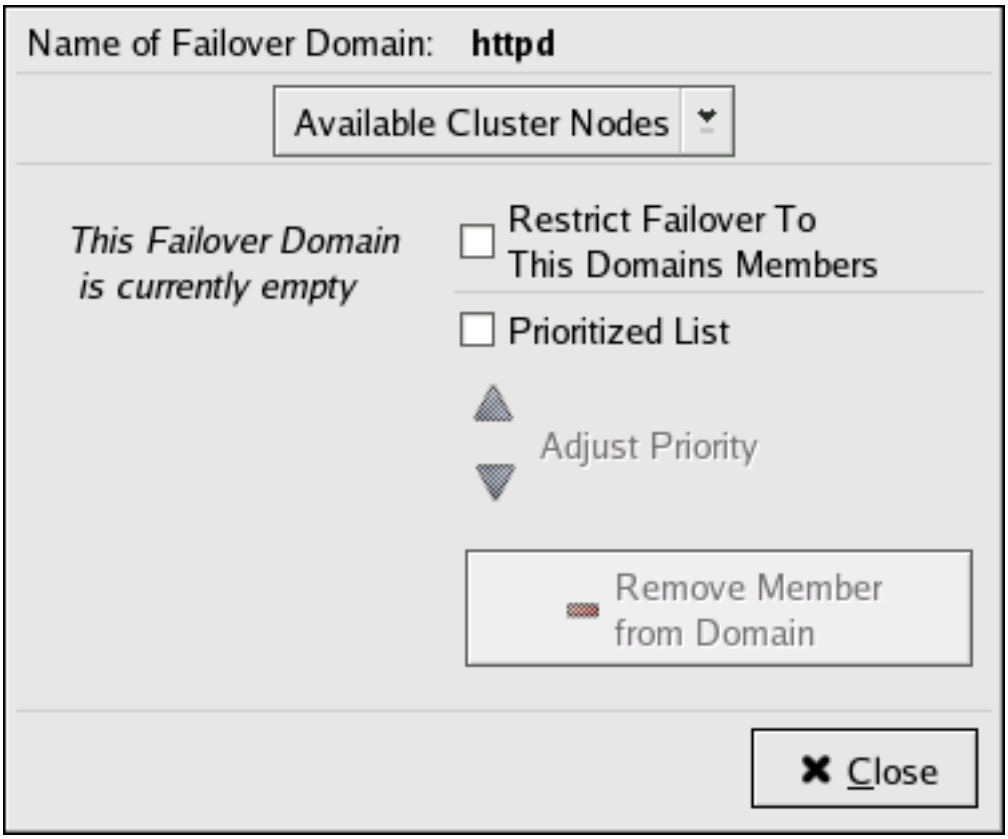

Figure 5.10. Failover Domain Configuration: Configuring a Failover Domain

4. Click the **Available Cluster Nodes** drop-down box and select the members for this failover domain.

5. To restrict failover to members in this failover domain, click (check) the **Restrict Failover To This Domains Members** checkbox. (With **Restrict Failover To This Domains Members** checked, services assigned to this failover domain fail over only to nodes in this failover domain.)

6. To prioritize the order in which the members in the failover domain assume control of a failed cluster service, follow these steps:

   a. Click (check) the **Prioritized List** checkbox (*Figure 5.11, "**Failover Domain Configuration**: Adjusting Priority"*). Clicking **Prioritized List** causes the **Priority** column to be displayed next to the **Member Node** column.

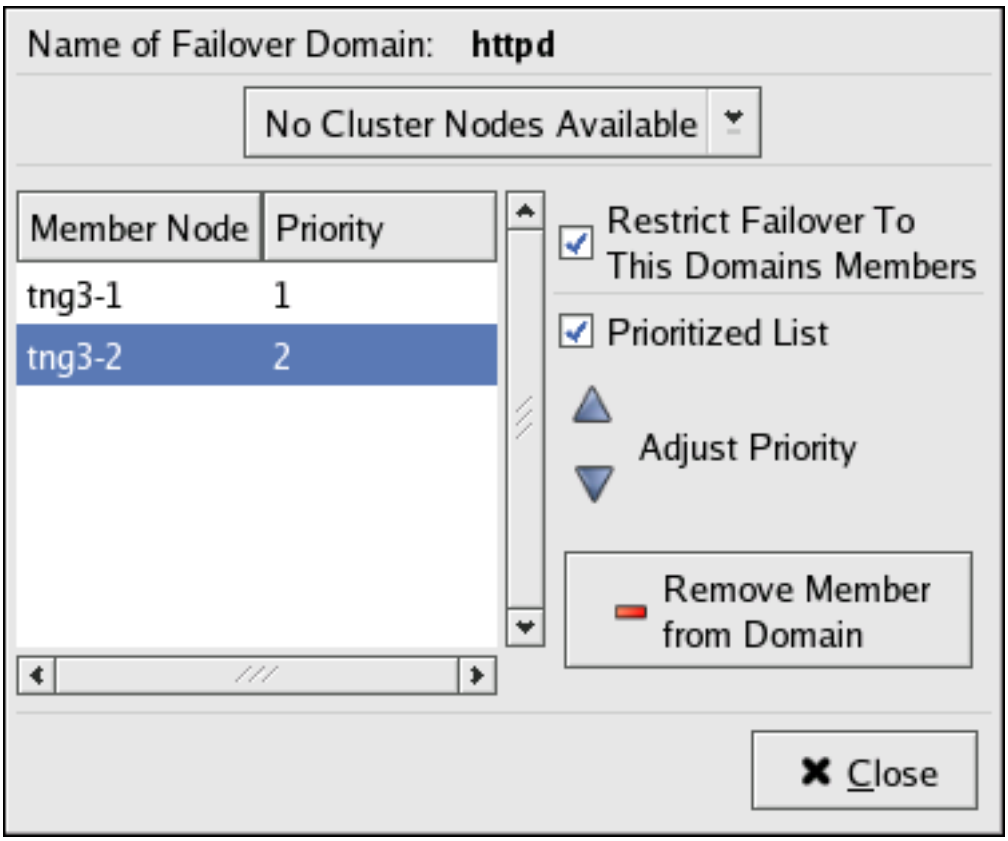

Figure 5.11. Failover Domain Configuration: Adjusting Priority

b. For each node that requires a priority adjustment, click the node listed in the **Member Node/Priority** columns and adjust priority by clicking one of the **Adjust Priority** arrows. Priority is indicated by the position in the **Member Node** column and the value in the **Priority** column. The node priorities are listed highest to lowest, with the highest priority node at the top of the **Member Node** column (having the lowest **Priority** number).

7. Click **Close** to create the domain.

8. At the **Cluster Configuration Tool**, perform one of the following actions depending on whether the configuration is for a new cluster or for one that is operational and running:

   - New cluster — If this is a new cluster, choose **File** => **Save** to save the changes to the cluster configuration.

   - Running cluster — If this cluster is operational and running, and you want to propagate the change immediately, click the **Send to Cluster** button. Clicking **Send to Cluster** automatically saves the configuration change. If you do not want to propagate the change immediately, choose **File** => **Save** to save the changes to the cluster configuration.

6.2. Removing a Failover Domain

To remove a failover domain, follow these steps:

1. At the left frame of the the **Cluster Configuration Tool**, click the failover domain that you want to delete (listed under **Failover Domains**).
2. At the bottom of the right frame (labeled **Properties**), click the **Delete Failover Domain** button. Clicking the **Delete Failover Domain** button causes a warning dialog box do be displayed asking if you want to remove the failover domain. Confirm that the failover domain identified in the warning dialog box is the one you want to delete and click **Yes**. Clicking **Yes** causes the failover domain to be removed from the list of failover domains under **Failover Domains** in the left frame of the **Cluster Configuration Tool**.
3. At the **Cluster Configuration Tool**, perform one of the following actions depending on whether the configuration is for a new cluster or for one that is operational and running:
   - New cluster — If this is a new cluster, choose **File** => **Save** to save the changes to the cluster configuration.
   - Running cluster — If this cluster is operational and running, and you want to propagate the change immediately, click the **Send to Cluster** button. Clicking **Send to Cluster** automatically saves the configuration change. If you do not want to propagate the change immediately, choose **File** => **Save** to save the changes to the cluster configuration.

6.3. Removing a Member from a Failover Domain

To remove a member from a failover domain, follow these steps:

1. At the left frame of the the **Cluster Configuration Tool**, click the failover domain that you want to change (listed under **Failover Domains**).
2. At the bottom of the right frame (labeled **Properties**), click the **Edit Failover Domain Properties** button. Clicking the **Edit Failover Domain Properties** button causes the **Failover Domain Configuration** dialog box to be displayed (*Figure 5.10, "**Failover Domain Configuration**: Configuring a Failover Domain"*).
3. At the **Failover Domain Configuration** dialog box, in the **Member Node** column, click the node name that you want to delete from the failover domain and click the **Remove Member from Domain** button. Clicking **Remove Member from Domain** removes the node from the **Member Node** column. Repeat this step for each node that is to be deleted from the failover domain. (Nodes must be deleted one at a time.)
4. When finished, click **Close**.
5. At the **Cluster Configuration Tool**, perform one of the following actions depending on whether the configuration is for a new cluster or for one that is operational and running:

- New cluster — If this is a new cluster, choose **File** => **Save** to save the changes to the cluster configuration.
- Running cluster — If this cluster is operational and running, and you want to propagate the change immediately, click the **Send to Cluster** button. Clicking **Send to Cluster** automatically saves the configuration change. If you do not want to propagate the change immediately, choose **File** => **Save** to save the changes to the cluster configuration.

7. Adding Cluster Resources

To specify a device for a cluster service, follow these steps:

1. On the **Resources** property of the **Cluster Configuration Tool**, click the **Create a Resource** button. Clicking the **Create a Resource** button causes the **Resource Configuration** dialog box to be displayed.
2. At the **Resource Configuration** dialog box, under **Select a Resource Type**, click the drop-down box. At the drop-down box, select a resource to configure. The resource options are described as follows:

   GFS

   Name — Create a name for the file system resource.

   Mount Point — Choose the path to which the file system resource is mounted.

   Device — Specify the device file associated with the file system resource.

   Options — Mount options.

   File System ID — When creating a new file system resource, you can leave this field blank. Leaving the field blank causes a file system ID to be assigned automatically after you click **OK** at the **Resource Configuration** dialog box. If you need to assign a file system ID explicitly, specify it in this field.

   Force Unmount checkbox — If checked, forces the file system to unmount. The default setting is unchecked. **Force Unmount** kills all processes using the mount point to free up the mount when it tries to unmount. With GFS resources, the mount point is *not* unmounted at service tear-down *unless* this box is checked.

   File System

   Name — Create a name for the file system resource.

   File System Type — Choose the file system for the resource using the drop-down menu.

   Mount Point — Choose the path to which the file system resource is mounted.

   Device — Specify the device file associated with the file system resource.

Options — Mount options.

File System ID — When creating a new file system resource, you can leave this field blank. Leaving the field blank causes a file system ID to be assigned automatically after you click **OK** at the **Resource Configuration** dialog box. If you need to assign a file system ID explicitly, specify it in this field.

Checkboxes — Specify mount and unmount actions when a service is stopped (for example, when disabling or relocating a service):

- **Force unmount** — If checked, forces the file system to unmount. The default setting is unchecked. **Force Unmount** kills all processes using the mount point to free up the mount when it tries to unmount.
- **Reboot host node if unmount fails** — If checked, reboots the node if unmounting this file system fails. The default setting is unchecked.
- **Check file system before mounting** — If checked, causes `fsck` to be run on the file system before mounting it. The default setting is unchecked.

IP Address

IP Address — Type the IP address for the resource.

Monitor Link checkbox — Check the box to enable or disable link status monitoring of the IP address resource

NFS Mount

Name — Create a symbolic name for the NFS mount.

Mount Point — Choose the path to which the file system resource is mounted.

Host — Specify the NFS server name.

Export Path — NFS export on the server.

NFS and **NFS4** options — Specify NFS protocol:

- **NFS** — Specifies using NFSv3 protocol. The default setting is **NFS**.
- **NFS4** — Specifies using NFSv4 protocol.

Options — Mount options. For more information, refer to the nfs(5) man page.

Force Unmount checkbox — If checked, forces the file system to unmount. The default setting is unchecked. **Force Unmount** kills all processes using the mount point to free up the mount when it tries to unmount.

NFS Client

Name — Enter a name for the NFS client resource.

Target — Enter a target for the NFS client resource. Supported targets are hostnames, IP

addresses (with wild-card support), and netgroups.

Read-Write and **Read Only** options — Specify the type of access rights for this NFS client resource:

- **Read-Write** — Specifies that the NFS client has read-write access. The default setting is **Read-Write**.
- **Read Only** — Specifies that the NFS client has read-only access.

Options — Additional client access rights. For more information, refer to the exports(5) man page, General Options

NFS Export

Name — Enter a name for the NFS export resource.

Script

Name — Enter a name for the custom user script.

File (with path) — Enter the path where this custom script is located (for example, `/etc/init.d/`*`userscript`*)

Samba Service

Name — Enter a name for the Samba server.

Workgroup — Enter the Windows workgroup name or Windows NT domain of the Samba service.

Note

When creating or editing a cluster service, connect a Samba-service resource directly to the service, *not* to a resource within a service. That is, at the **Service Management** dialog box, use either **Create a new resource for this service** or **Add a Shared Resource to this service**; do *not* use **Attach a new Private Resource to the Selection** or **Attach a Shared Resource to the selection**.

3. When finished, click **OK**.
4. Choose **File** => **Save** to save the change to the `/etc/cluster/cluster.conf` configuration file.

8. Adding a Cluster Service to the Cluster

To add a cluster service to the cluster, follow these steps:

1. At the left frame, click **Services**.

2. At the bottom of the right frame (labeled **Properties**), click the **Create a Service** button. Clicking **Create a Service** causes the **Add a Service** dialog box to be displayed.

3. At the **Add a Service** dialog box, type the name of the service in the **Name** text box and click **OK**. Clicking **OK** causes the **Service Management** dialog box to be displayed (refer to *Figure 5.12, "Adding a Cluster Service"*).

Tip

Use a descriptive name that clearly distinguishes the service from other services in the cluster.

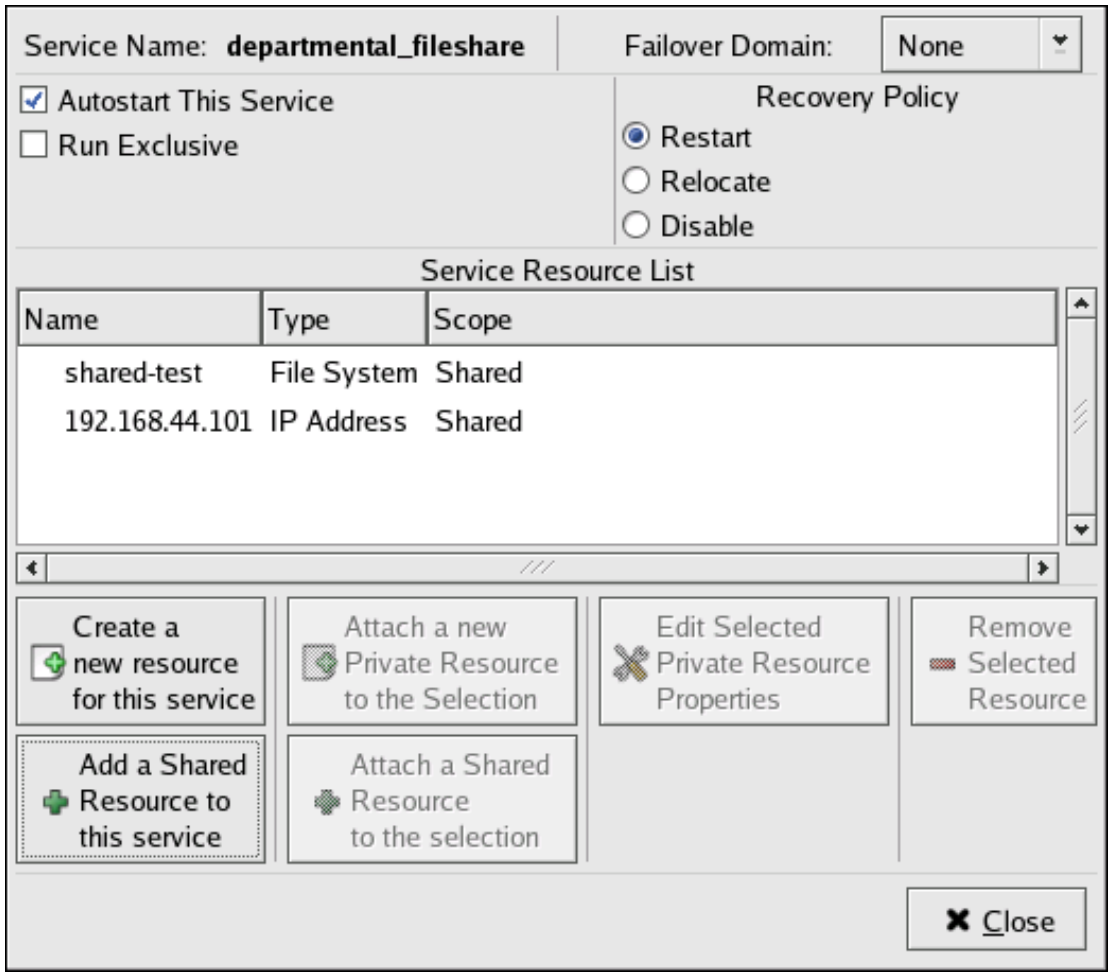

Figure 5.12. Adding a Cluster Service

4. If you want to restrict the members on which this cluster service is able to run, choose a failover domain from the **Failover Domain** drop-down box. (Refer to *Section 6, "Configuring*

a Failover Domain" for instructions on how to configure a failover domain.)

5. **Autostart This Service** checkbox — This is checked by default. If **Autostart This Service** is checked, the service is started automatically when a cluster is started and running. If **Autostart This Service** is *not* checked, the service must be started manually any time the cluster comes up from stopped state.

6. **Run Exclusive** checkbox — This sets a policy wherein the service only runs on nodes that have *no other* services running on them. For example, for a very busy web server that is clustered for high availability, it would would be advisable to keep that service on a node alone with no other services competing for his resources — that is, **Run Exclusive** checked. On the other hand, services that consume few resources (like NFS and Samba), can run together on the same node without little concern over contention for resources. For those types of services you can leave the **Run Exclusive** unchecked.

Note

Circumstances that require enabling **Run Exclusive** are rare. Enabling **Run Exclusive** can render a service offline if the node it is running on fails and no other nodes are empty.

7. Select a recovery policy to specify how the resource manager should recover from a service failure. At the upper right of the **Service Management** dialog box, there are three **Recovery Policy** options available:

   - **Restart** — Restart the service in the node the service is currently located. The default setting is **Restart**. If the service cannot be restarted in the the current node, the service is relocated.
   - **Relocate** — Relocate the service before restarting. Do not restart the node where the service is currently located.
   - **Disable** — Do not restart the service at all.

8. Click the **Add a Shared Resource to this service** button and choose the a resource listed that you have configured in *Section 7, "Adding Cluster Resources"*.

Note

If you are adding a Samba-service resource, connect a Samba-service resource directly to the service, *not* to a resource within a service. That is, at the **Service Management** dialog box, use either **Create a new resource for this service** or **Add a Shared Resource to this service**; do *not* use **Attach a new Private Resource to the Selection** or **Attach a Shared Resource to the selection**.

9. If needed, you may also create a *private* resource that you can create that becomes a subordinate resource by clicking on the **Attach a new Private Resource to the Selection** button. The process is the same as creating a shared resource described in *Section 7, "Adding Cluster Resources"*. The private resource will appear as a child to the shared resource to which you associated with the shared resource. Click the triangle icon next to the shared resource to display any private resources associated.

10. When finished, click **OK**.

11. Choose **File** => **Save** to save the changes to the cluster configuration.

Note

To verify the existence of the IP service resource used in a cluster service, you must use the `/sbin/ip addr list` command on a cluster node. The following output shows the `/sbin/ip addr list` command executed on a node running a cluster service:

```
1: lo: <LOOPBACK,UP> mtu 16436 qdisc noqueue
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP> mtu 1356 qdisc pfifo_fast qlen 1000
    link/ether 00:05:5d:9a:d8:91 brd ff:ff:ff:ff:ff:ff
    inet 10.11.4.31/22 brd 10.11.7.255 scope global eth0
    inet6 fe80::205:5dff:fe9a:d891/64 scope link
    inet 10.11.4.240/22 scope global secondary eth0
       valid_lft forever preferred_lft forever
```

9. Propagating The Configuration File: New Cluster

For newly defined clusters, you must propagate the configuration file to the cluster nodes as follows:

1. Log in to the node where you created the configuration file.

2. Using the `scp` command, copy the `/etc/cluster/cluster.conf` file to all nodes in the cluster.

Note

Propagating the cluster configuration file this way is necessary for the first time a cluster is created. Once a cluster is installed and running, the cluster configuration file is propagated using the Red Hat cluster management GUI **Send to Cluster** button. For more information about propagating the cluster configuration using the GUI **Send to Cluster** button, refer to *Section 3, "Modifying the Cluster Configuration"*.

10. Starting the Cluster Software

After you have propagated the cluster configuration to the cluster nodes you can either reboot each node or start the cluster software on each cluster node by running the following commands at each node in this order:

1. `service ccsd start`
2. `service cman start` (or `service lock_gulmd start` for GULM clusters)
3. `service fenced start` (DLM clusters only)
4. `service clvmd start`, if CLVM has been used to create clustered volumes

Note

Shared storage for use in Red Hat Cluster Suite requires that you be running the cluster logical volume manager daemon (`clvmd`) or the High Availability Logical Volume Management agents (HA-LVM). If you are not able to use either the `clvmd` daemon or HA-LVM for operational reasons or because you do not have the correct entitlements, you must not use single-instance LVM on the shared disk as this may result in data corruption. If you have any concerns please contact your Red Hat service representative.

5. `service gfs start`, if you are using Red Hat GFS
6. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)
7. Start the Red Hat Cluster Suite management GUI. At the **Cluster Configuration Tool** tab, verify that the configuration is correct. At the **Cluster Status Tool** tab verify that the nodes and services are running as expected.

Managing Red Hat Cluster With system-config-cluster

This chapter describes various administrative tasks for managing a Red Hat Cluster and consists of the following sections:

- *Section 1, “Starting and Stopping the Cluster Software”*
- *Section 2, “Managing High-Availability Services”*
- *Section 4, “Backing Up and Restoring the Cluster Database”*
- *Section 5, “Disabling the Cluster Software”*
- *Section 6, “Diagnosing and Correcting Problems in a Cluster”*

1. Starting and Stopping the Cluster Software

To start the cluster software on a member, type the following commands in this order:

1. `service ccsd start`
2. `service cman start` (or `service lock_gulmd start` for GULM clusters)
3. `service fenced start` (DLM clusters only)
4. `service clvmd start`, if CLVM has been used to create clustered volumes
5. `service gfs start`, if you are using Red Hat GFS
6. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)

To stop the cluster software on a member, type the following commands in this order:

1. `service rgmanager stop`, if the cluster is running high-availability services (`rgmanager`)
2. `service gfs stop`, if you are using Red Hat GFS
3. `service clvmd stop`, if CLVM has been used to create clustered volumes
4. `service fenced stop` (DLM clusters only)
5. `service cman stop` (or `service lock_gulmd stop` for GULM clusters)
6. `service ccsd stop`

Stopping the cluster services on a member causes its services to fail over to an active member.

2. Managing High-Availability Services

You can manage cluster services with the **Cluster Status Tool** (*Figure 6.1, "**Cluster Status Tool**"*) through the **Cluster Management** tab in Cluster Administration GUI.

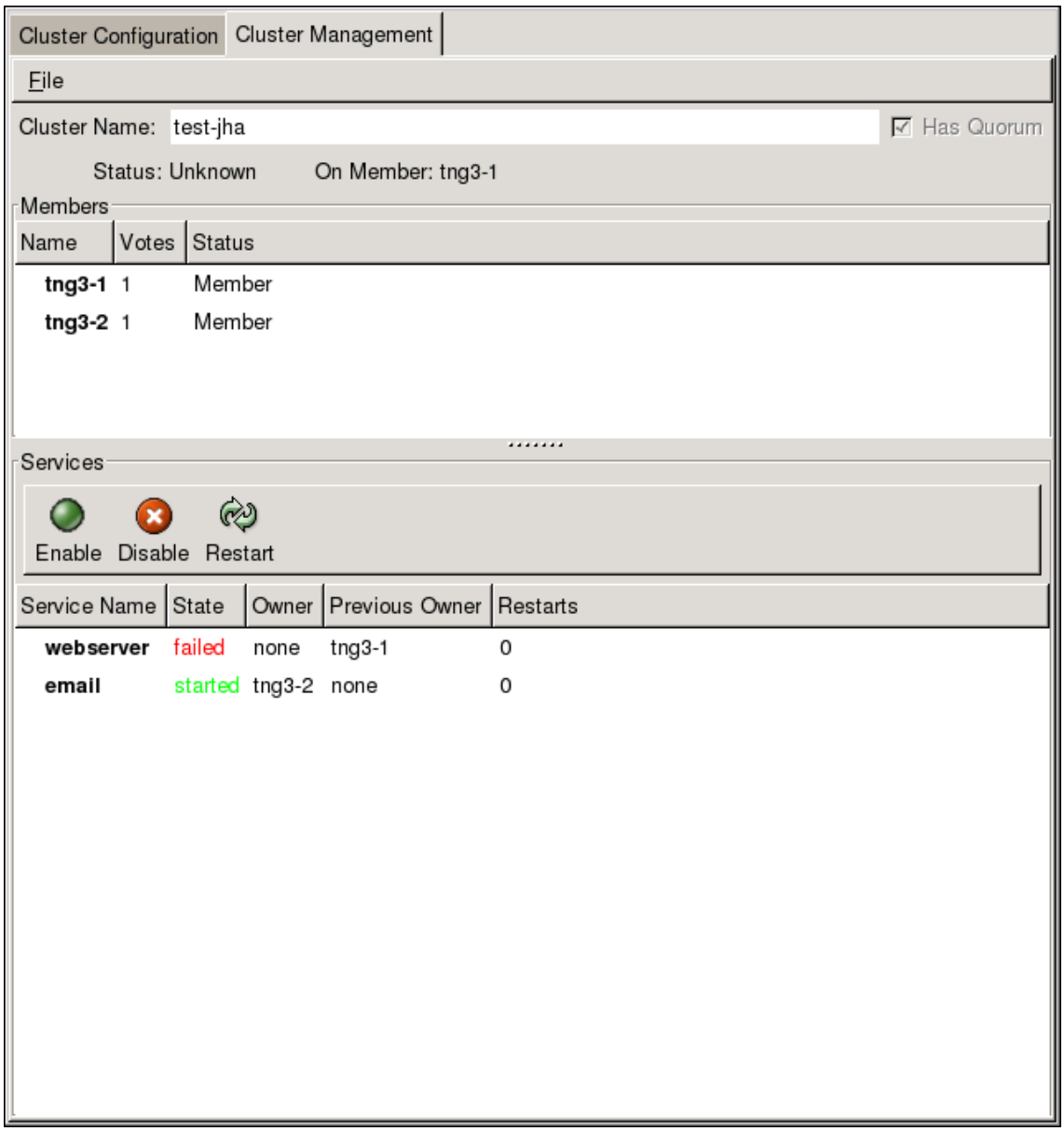

Figure 6.1. Cluster Status Tool

You can use the **Cluster Status Tool** to enable, disable, restart, or relocate a high-availability service. The **Cluster Status Tool** displays the current cluster status in the **Services** area and automatically updates the status every 10 seconds.

To enable a service, you can select the service in the **Services** area and click **Enable**. To disable a service, you can select the service in the **Services** area and click **Disable**. To restart a service, you can select the service in the **Services** area and click **Restart**. To relocate a service from one node to another, you can drag the service to another node and drop the service onto that node. Relocating a service restarts the service on that node. (Relocating a service to its current node — that is, dragging a service to its current node and dropping the service onto that node — restarts the service.)

The following tables describe the members and services status information displayed by the **Cluster Status Tool**.

Members Status	Description
Member	The node is part of the cluster. Note: A node can be a member of a cluster; however, the node may be inactive and incapable of running services. For example, if `rgmanager` is not running on the node, but all other cluster software components are running in the node, the node appears as a **Member** in the **Cluster Status Tool**.
Dead	The node is unable to participate as a cluster member. The most basic cluster software is not running on the node.

Table 6.1. Members Status

Services Status	Description
Started	The service resources are configured and available on the cluster system that owns the service.
Pending	The service has failed on a member and is pending start on another member.
Disabled	The service has been disabled, and does not have an assigned owner. A disabled service is never restarted automatically by the cluster.
Stopped	The service is not running; it is waiting for a member capable of starting the service. A service remains in the stopped state if autostart is disabled.
Failed	The service has failed to start on the cluster and cannot successfully stop the service. A failed service is never restarted automatically by the cluster.

Table 6.2. Services Status

3. Modifying the Cluster Configuration

To modify the cluster configuration (the cluster configuration file (/etc/cluster/cluster.conf), use the **Cluster Configuration Tool**. For more information about using the **Cluster Configuration Tool**, refer to *Chapter 5, Configuring Red Hat Cluster With system-config-cluster*.

Warning

Do not manually edit the contents of the /etc/cluster/cluster.conf file without guidance from an authorized Red Hat representative or unless you fully understand the consequences of editing the /etc/cluster/cluster.conf file manually.

Important

Although the **Cluster Configuration Tool** provides a **Quorum Votes** parameter in the **Properties** dialog box of each cluster member, that parameter is intended *only* for use during initial cluster configuration. Furthermore, it is recommended that you retain the default **Quorum Votes** value of **1**. For more information about using the **Cluster Configuration Tool**, refer to *Chapter 5, Configuring Red Hat Cluster With system-config-cluster*.

Important

If you are changing the number of cluster members, refer to *Section 5, "Adding and Deleting Members"*. You must take into account certain circumstances for both DLM and GULM clusters when adding or deleting members.

To edit the cluster configuration file, click the **Cluster Configuration** tab in the cluster configuration GUI. Clicking the **Cluster Configuration** tab displays a graphical representation of the cluster configuration. Change the configuration file according the the following steps:

1. Make changes to cluster elements (for example, create a service).
2. Propagate the updated configuration file throughout the cluster by clicking **Send to Cluster**.

Note

The **Cluster Configuration Tool** does not display the **Send to Cluster** button if

the cluster is new and has not been started yet, or if the node from which you are running the **Cluster Configuration Tool** is not a member of the cluster. If the **Send to Cluster** button is not displayed, you can still use the **Cluster Configuration Tool**; however, you cannot propagate the configuration. You can still *save* the configuration file. For information about using the **Cluster Configuration Tool** for a new cluster configuration, refer to *Chapter 5, Configuring Red Hat Cluster With `system-config-cluster`*.

3. Clicking **Send to Cluster** causes a **Warning** dialog box to be displayed. Click **Yes** to save and propagate the configuration.
4. Clicking **Yes** causes an **Information** dialog box to be displayed, confirming that the current configuration has been propagated to the cluster. Click **OK**.
5. Click the **Cluster Management** tab and verify that the changes have been propagated to the cluster members.

4. Backing Up and Restoring the Cluster Database

The **Cluster Configuration Tool** automatically retains backup copies of the three most recently used configuration files (besides the currently used configuration file). Retaining the backup copies is useful if the cluster does not function correctly because of misconfiguration and you need to return to a previous working configuration.

Each time you save a configuration file, the **Cluster Configuration Tool** saves backup copies of the three most recently used configuration files as `/etc/cluster/cluster.conf.bak.1`, `/etc/cluster/cluster.conf.bak.2`, and `/etc/cluster/cluster.conf.bak.3`. The backup file `/etc/cluster/cluster.conf.bak.1` is the newest backup, `/etc/cluster/cluster.conf.bak.2` is the second newest backup, and `/etc/cluster/cluster.conf.bak.3` is the third newest backup.

If a cluster member becomes inoperable because of misconfiguration, restore the configuration file according to the following steps:

1. At the **Cluster Configuration Tool** tab of the Red Hat Cluster Suite management GUI, click **File** => **Open**.
2. Clicking **File => Open** causes the **system-config-cluster** dialog box to be displayed.
3. At the the **system-config-cluster** dialog box, select a backup file (for example, `/etc/cluster/cluster.conf.bak.1`). Verify the file selection in the **Selection** box and click **OK**.
4. Increment the configuration version beyond the current working version number as follows:

a. Click **Cluster** => **Edit Cluster Properties**.

b. At the **Cluster Properties** dialog box, change the **Config Version** value and click **OK**.

5. Click **File** => **Save As**.

6. Clicking **File** => **Save As** causes the **system-config-cluster** dialog box to be displayed.

7. At the the **system-config-cluster** dialog box, select `/etc/cluster/cluster.conf` and click **OK**. (Verify the file selection in the **Selection** box.)

8. Clicking **OK** causes an **Information** dialog box to be displayed. At that dialog box, click **OK**.

9. Propagate the updated configuration file throughout the cluster by clicking **Send to Cluster**.

Note

The **Cluster Configuration Tool** does not display the **Send to Cluster** button if the cluster is new and has not been started yet, or if the node from which you are running the **Cluster Configuration Tool** is not a member of the cluster. If the **Send to Cluster** button is not displayed, you can still use the **Cluster Configuration Tool**; however, you cannot propagate the configuration. You can still *save* the configuration file. For information about using the **Cluster Configuration Tool** for a new cluster configuration, refer to *Chapter 5, Configuring Red Hat Cluster With `system-config-cluster`*.

10. Clicking **Send to Cluster** causes a **Warning** dialog box to be displayed. Click **Yes** to propagate the configuration.

11. Click the **Cluster Management** tab and verify that the changes have been propagated to the cluster members.

5. Disabling the Cluster Software

It may become necessary to temporarily disable the cluster software on a cluster member. For example, if a cluster member experiences a hardware failure, you may want to reboot that member, but prevent it from rejoining the cluster to perform maintenance on the system.

Use the `/sbin/chkconfig` command to stop the member from joining the cluster at boot-up as follows:

```
# chkconfig --level 2345 rgmanager off
# chkconfig --level 2345 gfs off
# chkconfig --level 2345 clvmd off
# chkconfig --level 2345 fenced off
```

```
# chkconfig --level 2345 lock_gulmd off
# chkconfig --level 2345 cman off
# chkconfig --level 2345 ccsd off
```

Once the problems with the disabled cluster member have been resolved, use the following commands to allow the member to rejoin the cluster:

```
# chkconfig --level 2345 rgmanager on
# chkconfig --level 2345 gfs on
# chkconfig --level 2345 clvmd on
# chkconfig --level 2345 fenced on
# chkconfig --level 2345 lock_gulmd on
# chkconfig --level 2345 cman on
# chkconfig --level 2345 ccsd on
```

You can then reboot the member for the changes to take effect or run the following commands in the order shown to restart cluster software:

1. `service ccsd start`
2. `service cman start` (or `service lock_gulmd start` for GULM clusters)
3. `service fenced start` (DLM clusters only)
4. `service clvmd start`, if CLVM has been used to create clustered volumes
5. `service gfs start`, if you are using Red Hat GFS
6. `service rgmanager start`, if the cluster is running high-availability services (`rgmanager`)

6. Diagnosing and Correcting Problems in a Cluster

For information about diagnosing and correcting problems in a cluster, contact an authorized Red Hat support representative.

Appendix A. Example of Setting Up Apache HTTP Server

This appendix provides an example of setting up a highly available Apache HTTP Server on a Red Hat Cluster. The example describes how to set up a service to fail over an Apache HTTP Server. Variables in the example apply to this example only; they are provided to assist setting up a service that suits your requirements.

Note

This example uses the **Cluster Configuration Tool** (`system-config-cluster`). You can use comparable **Conga** functions to make an Apache HTTP Server highly available on a Red Hat Cluster.

1. Apache HTTP Server Setup Overview

First, configure Apache HTTP Server on all nodes in the cluster. If using a failover domain , assign the service to all cluster nodes configured to run the Apache HTTP Server. Refer to *Section 6, "Configuring a Failover Domain"* for instructions. The cluster software ensures that only one cluster system runs the Apache HTTP Server at one time. The example configuration consists of installing the `httpd` RPM package on all cluster nodes (or on nodes in the failover domain, if used) and configuring a shared GFS shared resource for the Web content.

When installing the Apache HTTP Server on the cluster systems, run the following command to ensure that the cluster nodes do not automatically start the service when the system boots:

```
# chkconfig --del httpd
```

Rather than having the system init scripts spawn the `httpd` daemon, the cluster infrastructure initializes the service on the active cluster node. This ensures that the corresponding IP address and file system mounts are active on only one cluster node at a time.

When adding an `httpd` service, a *floating* IP address must be assigned to the service so that the IP address will transfer from one cluster node to another in the event of failover or service relocation. The cluster infrastructure binds this IP address to the network interface on the cluster system that is currently running the Apache HTTP Server. This IP address ensures that the cluster node running `httpd` is transparent to the clients accessing the service.

The file systems that contain the Web content cannot be automatically mounted on the shared storage resource when the cluster nodes boot. Instead, the cluster software must mount and unmount the file system as the `httpd` service is started and stopped. This prevents the cluster

systems from accessing the same data simultaneously, which may result in data corruption. Therefore, do not include the file systems in the `/etc/fstab` file.

2. Configuring Shared Storage

To set up the shared file system resource, perform the following tasks as root on one cluster system:

1. On one cluster node, use the interactive `parted` utility to create a partition to use for the document root directory. Note that it is possible to create multiple document root directories on different disk partitions.
2. Use the `mkfs` command to create an ext3 file system on the partition you created in the previous step. Specify the drive letter and the partition number. For example:

```
# mkfs -t ext3 /dev/sde3
```

3. Mount the file system that contains the document root directory. For example:

```
# mount /dev/sde3 /var/www/html
```

   Do not add this mount information to the `/etc/fstab` file because only the cluster software can mount and unmount file systems used in a service.

4. Copy all the required files to the document root directory.
5. If you have CGI files or other files that must be in different directories or in separate partitions, repeat these steps, as needed.

3. Installing and Configuring the Apache HTTP Server

The Apache HTTP Server must be installed and configured on all nodes in the assigned failover domain, if used, or in the cluster. The basic server configuration must be the same on all nodes on which it runs for the service to fail over correctly. The following example shows a basic Apache HTTP Server installation that includes no third-party modules or performance tuning.

On all node in the cluster (or nodes in the failover domain, if used), install the `httpd` RPM package. For example:

`rpm -Uvh httpd-<version>.<arch>.rpm`

To configure the Apache HTTP Server as a cluster service, perform the following tasks:

1. Edit the `/etc/httpd/conf/httpd.conf` configuration file and customize the file according to

your configuration. For example:

- Specify the directory that contains the HTML files. Also specify this mount point when adding the service to the cluster configuration. It is only required to change this field if the mount point for the web site's content differs from the default setting of `/var/www/html/`. For example:

```
DocumentRoot "/mnt/httpdservice/html"
```

- Specify a unique IP address to which the service will listen for requests. For example:

```
Listen 192.168.1.100:80
```

  This IP address then must be configured as a cluster resource for the service using the **Cluster Configuration Tool**.

- If the script directory resides in a non-standard location, specify the directory that contains the CGI programs. For example:

```
ScriptAlias /cgi-bin/ "/mnt/httpdservice/cgi-bin/"
```

- Specify the path that was used in the previous step, and set the access permissions to default to that directory. For example:

```
<Directory /mnt/httpdservice/cgi-bin">
AllowOverride None
Options None
Order allow,deny
Allow from all
</Directory>
```

  Additional changes may need to be made to tune the Apache HTTP Server or add module functionality. For information on setting up other options, refer to the *Red Hat Enterprise Linux System Administration Guide* and the *Red Hat Enterprise Linux Reference Guide*.

2. The standard Apache HTTP Server start script, `/etc/rc.d/init.d/httpd` is also used within the cluster framework to start and stop the Apache HTTP Server on the active cluster node. Accordingly, when configuring the service, specify this script by adding it as a **Script** resource in the **Cluster Configuration Tool**.

3. Copy the configuration file over to the other nodes of the cluster (or nodes of the failover domain, if configured).

Before the service is added to the cluster configuration, ensure that the Apache HTTP Server directories are not mounted. Then, on one node, invoke the **Cluster Configuration Tool** to add the service, as follows. This example assumes a failover domain named `httpd-domain` was created for this service.

1. Add the init script for the Apache HTTP Server service.
   - Select the **Resources** tab and click **Create a Resource**. The **Resources Configuration** properties dialog box is displayed.
   - Select **Script** form the drop down menu.
   - Enter a **Name** to be associated with the Apache HTTP Server service.
   - Specify the path to the Apache HTTP Server init script (for example, **`/etc/rc.d/init.d/httpd`**) in the **File (with path)** field.
   - Click **OK**.
2. Add a device for the Apache HTTP Server content files and/or custom scripts.
   - Click **Create a Resource**.
   - In the **Resource Configuration** dialog, select **File System** from the drop-down menu.
   - Enter the **Name** for the resource (for example, **`httpd-content`**.
   - Choose **ext3** from the **File System Type** drop-down menu.
   - Enter the mount point in the **Mount Point** field (for example, **`/var/www/html/`**).
   - Enter the device special file name in the **Device** field (for example, **`/dev/sda3`**).
3. Add an IP address for the Apache HTTP Server service.
   - Click **Create a Resource**.
   - Choose **IP Address** from the drop-down menu.
   - Enter the **IP Address** to be associated with the Apache HTTP Server service.
   - Make sure that the **Monitor Link** checkbox is left checked.
   - Click **OK**.
4. Click the **Services** property.
5. Create the Apache HTTP Server service.
   - Click **Create a Service**. Type a **Name** for the service in the **Add a Service** dialog.
   - In the **Service Management** dialog, select a **Failover Domain** from the drop-down menu

or leave it as **None**.

- Click the **Add a Shared Resource to this service** button. From the available list, choose each resource that you created in the previous steps. Repeat this step until all resources have been added.
- Click **OK**.

6. Choose **File** => **Save** to save your changes.

Appendix B. Fence Device Parameters

This appendix provides tables with parameter descriptions of fence devices.

Note

Certain fence devices have an optional **Password Script** parameter. The **Password Script**parameter allows specifying that a fence-device password is supplied from a script rather than from the **Password** parameter. Using the **Password Script** parameter supersedes the **Password** parameter, allowing passwords to not be visible in the cluster configuration file (`/etc/cluster/cluster.conf`).

Field	Description
Name	A name for the APC device connected to the cluster.
IP Address	The IP address assigned to the device.
Login	The login name used to access the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.1. APC Power Switch

Field	Description
Name	A name for the Brocade device connected to the cluster.
IP Address	The IP address assigned to the device.
Login	The login name used to access the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.2. Brocade Fabric Switch

Field	Description
IP Address	The IP address assigned to the PAP console.
Login	The login name used to access the PAP console.
Password	The password used to authenticate the connection to the PAP console.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.
Domain	Domain of the Bull PAP system to power cycle

Table B.3. Bull PAP (Platform Administration Processor)

Field	Description
Name	The name assigned to the DRAC.
IP Address	The IP address assigned to the DRAC.
Login	The login name used to access the DRAC.
Password	The password used to authenticate the connection to the DRAC.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.4. Dell DRAC

Field	Description
Name	A name for the BladeFrame device connected to the cluster.
CServer	The hostname (and optionally the username in the form of **`username@hostname`**) assigned to the device. Refer to the fence_egenera(8) man page.
ESH Path (optional)	The path to the esh command on the cserver (default is /opt/pan- mgr/bin/esh)

Table B.5. Egenera SAN Controller

Field	Description
Name	A name for the GNBD device used to fence the cluster. Note that the GFS server must be accessed via GNBD for cluster node fencing support.
Server	The hostname of each GNBD to disable. For multiple hostnames, separate each hostname with a space.

Table B.6. GNBD (Global Network Block Device)

Field	Description
Name	A name for the server with HP iLO support.
Hostname	The hostname assigned to the device.
Login	The login name used to access the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.7. HP iLO (Integrated Lights Out)

Field	Description
Name	A name for the IBM BladeCenter device connected to the cluster.
IP Address	The IP address assigned to the device.
Login	The login name used to access the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.8. IBM Blade Center

Field	Description
Name	A name for the RSA device connected to the cluster.
IP Address	The IP address assigned to the device.
Login	The login name used to access the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.9. IBM Remote Supervisor Adapter II (RSA II)

Field	Description
IP Address	The IP address assigned to the IPMI port.

Field	Description
Login	The login name of a user capable of issuing power on/off commands to the given IPMI port.
Password	The password used to authenticate the connection to the IPMI port.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.
Authentication Type	`none`, `password`, `md2`, or `md5`
Use Lanplus	`True` or `1`. If blank, then value is `False`.

Table B.10. IPMI (Intelligent Platform Management Interface) LAN

Field	Description
Name	A name to assign the Manual fencing agent. Refer to `fence_manual`(8) for more information.

Table B.11. Manual Fencing

Warning

Manual fencing is *not* supported for production environments.

Field	Description
Name	A name for the McData device connected to the cluster.
IP Address	The IP address assigned to the device.
Login	The login name used to access the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.12. McData SAN Switch

Field	Description
Name	A name for the WTI RPS-10 power switch connected to the cluster.
Device	The device the switch is connected to on the controlling host (for example, `/dev/ttys2`).

Field	Description
Port	The switch outlet number.

Table B.13. RPS-10 Power Switch (two-node clusters only)

Field	Description
Name	A name for the SANBox2 device connected to the cluster.
IP Address	The IP address assigned to the device.
Login	The login name used to access the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.14. QLogic SANBox2 Switch

Field	Description
Name	Name of the node to be fenced. Refer to `fence_scsi`(8) for more information.

Table B.15. SCSI Fencing

Field	Description
Name	Name of the guest to be fenced.

Table B.16. Virtual Machine Fencing

Field	Description
Name	A name for the Vixel switch connected to the cluster.
IP Address	The IP address assigned to the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.17. Vixel SAN Switch

Field	Description
Name	A name for the WTI power switch connected to the cluster.
IP Address	The IP address assigned to the device.
Password	The password used to authenticate the connection to the device.
Password Script (optional)	The script that supplies a password for access to the fence device. Using this supersedes the **Password** parameter.

Table B.18. WTI Power Switch

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